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Addresses.

CERTAIN OCCUPATIONS AS CONTRIBUTING FACTORS TO DISEASES OF THE SKIN.[*]

By Charles J. White, M.D., Boston,

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With the rapid movement of the modern world toward social betterment, there has been initiated a most commendable desire to help the workingman in many ways. Increased wages, shorter hours, and healthier homes and working places have been obtained, and, in addition to these benefits, the authorities, with the aid of the medical profession, have undertaken a systematic investigation of the laborer's occupation, in an endeavor to discover and to eradicate, in so far as is possible, the noxious elements of his daily work.

The study and knowledge of occupational diseases are not new themes in what has been called law-abiding Germany, nor in conservative England, but in our easy-going, lenient United States, enthusiasm and zeal toward this wholly proper branch of social welfare have been awakened rather slowly, and it is only within two years or so that even the Massachusetts General Hospital, which we like to regard as a most progressive institution, has seen fit to establish a bureau devoted wholly to the study and recording of this branch of medico-social work.

It is not our intention to say that doctors have not known for a long time, more or less, about a few diseases associated with or caused by certain occupations, for this would be a misleading assertion, but it seems fair to state that any intensive study of this special division of knowledge is of comparatively recent origin in this country. There is an exception to this general rule, however, in favor of the skin specialists, who for many years have studied the causes of certain baffling diseases with the greatest detail, and have recorded in their special books and periodicals many interesting and important facts. But general medicine has not bothered over-much about the doings of dermatologists, and it may be that the world has been a loser thereby.

It is my wish, therefore, in the brief hour at my disposal, to tell you in so far as I may, what dermatologists have learned about the skin in its relation to man's work. This is not an easy task, I assure you, for the facts are many and the time is short; and one must avoid falling into the error of reading a mere catalogue, which might be useful to a student, but would form dry material for a public recital.

In treating this really large subject, we must be systematic and divide up the whole question into subdivisions, and I think some of you at least will be surprised at the number of headings we shall develop.

DISEASES OF THE TROPICS.

In the first place let us speak of the man, be he soldier or sailor or engineer or explorer or doctor, or what not, whose duty calls him to the tropics. Every year, more or less, we at the Massachusetts General Hospital have the unpleasant duty of discovering a leper, and in almost every instance the pitiable victim has hailed from the warm countries of the earth or else has visited them in his work. I need not dwell upon the details of this disease, for you know somewhat concerning it. It has been our lot also to recognize and to treat a man suffering from framboesia, or yaws, a disease which was for a long time confused with syphilis and not without reason, but modern science has discovered that both diseases owe their origin to a protozoän called the spirocheta, one taking artificial stains very faintly and the other being considerably longer and relatively more delicate—I refer to the spirocheta pallida of syphilis and the spirocheta pertennuis of yaws. We have also been fortunate enough to identify an active example of the so-called "oriental sore"—a disease which is indigenous to the northern coast of Africa, the eastern shores of the Mediterranean, and the lands watered by the Indian Ocean. This affection has almost as many names as it has places of origin, but at present we know that this much be-titled malady is due to a minute animal belonging to the same group as the plasmodium of malaria. If you will look at many Armenians in Boston you will perceive on their faces a large depressed scar, and this is the stigma of a past infection of "oriental sore"; but the case I have referred to is the only one, I believe, which has been observed in Boston in its active stage. Elephantiasis, which signifies a huge enlargement of a limb, as a rule, is another disease which can be acquired in the warm countries. We have the disease here, you know, following repeated attacks of inflammation of the connective tissue of the skin, as, for example, erysipelas—but in the tropics the disease is acquired from the bite of a mosquito which harbors the embryo of a worm known as the filaria sanguinis. In addition to these diseases, man may acquire special forms of ringworm which flourish mightily in the heat and moisture of the tropics, so that his body may become completely covered with the plant. Or again, the human foot may become, from an infection closely related to the actinomyces fungus, the seat of a great swelling and abscess formation to such an extent that amputation becomes a blessing. This is called Madura foot, and falls to the lot of some who live or work in the Near East. And, finally, there is a peculiar wart-like growth found in the valleys of the Andes and known as the verruca Peruviana—a disease which Dr. Strong and his colleagues studied in their expedition of 1914.

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[*] Delivered at the Harvard Medical School, February 27, 1916.

DISEASES DUE TO ABNORMAL TEMPERATURES AND ATMOSPHERES IN THE TEMPERATE ZONES.

In the second place we shall speak of diseases produced in the temperate zones by abnormal conditions of heat, or cold, or moisture, or dryness.

High Temperatures. The stationary fireman, who constantly opens his furnace door to throw in coal may acquire a permanently red condition of his lower legs due to the frequent blasts of hot air which flash against his skin. The baker who opens his hot oven door to insert his loaves is apt to suffer from a distressing eczema of the arms. The foundryman who handles his molten metal is liable to severe burns from splashing drops or from sparks which fly when the cooling metal is hammered, and the blacksmith may suffer a similar injury. We all know of the many forms of accidental explosions to which the members of our fire department are liable. These are some of the examples of diseases due to heat.

Low Temperatures. On the other hand, we are familiar with the chilblains and frostbites which fall to the lot of those whose vocations expose them to severe or to continued cold. These are the chauffeurs, cabmen, policemen, freight crews, soldiers, sailors, cold storage men, quarriers, ice handlers, ice cream makers, soda fountain attendants, and many others. One of the striking hardships of the soldiers of the present war has been their lot of standing for hours, and even days, in the half frozen waters of the trenches. A curious cause of chilblains came to my notice the other day in the case of a young girl whose duty it was to pack chocolates day in and day out in a room unheated in winter and artificially chilled in summer, and through long hours this girl removed chocolates from a cold moving belt, upon which a blast of cold air was directed from above. The resulting cutaneous disability was not to be wondered at.

The humidity or the dryness of the surrounding atmosphere plays an important rôle in certain occupations. A laundress, stooping for hours over her washtubs in hot, dog-day weather, may find her face red and to a greater or smaller extent dotted with sago-like grains. This condition, which we term hydrocystoma, is due to the plugging of the mouths of the sweat ducts of the skin, and in the moist heat the perspiration, becoming excessive and not being able to reach the surface, backs up and forms chambers of fluid. As you know, certain processes in the manufacture of sugar must be conducted in superheated rooms, and in some men, subjected to this heat and moisture, boils are very apt to develop.

Excessive Dryness. The dryness of the atmosphere exercises an even greater part in the susceptibility of, or, perhaps more accurately stated, the sensitization of men's skin to the noxious elements of their labor. Perspiration contains a good deal of fat and in normal amounts means much more to our comfort than most of us realize. In our New England autumn and winter the air is very dry but craves moisture, and without our knowledge or consent steals what it can from our skins. You know the result,—our hands and wrists and ankles chap and crack and our skins prickle and tingle and we are uncomfortable. This dryness and consequent fissuring of the integument mean the breaking down of man's chief defense against the ever-present surrounding bacteria and the irritating substances of his existence, and often constitute the determining factor of disease or health; and in consequence we who see and treat many diseases of the skin dread the advent of fall and winter, for we know how difficult it becomes to treat our patients under these adverse and rather unconquerable circumstances. One of the things I would do if I had money would be to build a skin hospital, equipped with a large green-house, and in this favorable, warm, moist atmosphere I believe I could cure, or at least alleviate, some of the cutaneous ills of winter. As will be seen, therefore, most of us have to contend with atmospheric dryness for a certain part of the year, but the men whose paths lie in the far north, or the men whose lives are spent among high mountains, must endure these conditions the year round. You who have read the exciting tales of Arctic travel will recall the fact that these hardy travellers find it absolutely necessary to anoint the skin of their faces to preserve it from destruction. At this point it may not be out of place to refer to the similar drying effects of alkaline water, which the herdsmen and civil engineers and railroad construction men of our southwestern deserts have to endure. The African, the Indian, the Mexican can endure and withstand the desiccation of the desert wind and water because Nature has endowed them with greasy skins, but the Caucasian whose lot is cast in these climes is not to be envied.

Increased Air Pressure. High air pressure exerts its influence on the human skin as it does on other human organs, and we have noted in the victims of caisson disease a peculiar condition known as purpura. In other words, the men who are building our underground railways or are laying the foundations of our modern bridges and sky scrapers exhibit a tendency for the blood to be forced out of its normal channels into the surrounding tissues, thus leaving a temporary or permanent, indelible stain in the skin. This discoloration is blotchy and at first red, but on the lower legs of the older workmen this red tinge becomes a chocolate brown and remains as such indefinitely.

Excessive Light. You know that all light contains at least two distinct elements—the so-called heat rays and the so-called actinic rays. We have already described the effects of heat in speaking of the fireman, the baker, the foundryman, and, of course, there are other sufferers from this natural element; but now we want to refer to those who fall victims to what are called the chemical rays of light. You have all noted the peculiar skin of the hands, forearms, and especially the neck, of farmers and gardeners and trench diggers and fishermen and sailors—you have observed the brown color, the thickness, and in the case of the neck the deep creases and at times tortuous folds of the skin. These conditions are common, but in certain susceptible individuals the sun produces more important changes. The skin of the face, or the back of the hands, may become in places a still darker brown and rough and scaly—a condition which we call keratosis; and, as a further development, cancer may arise *de novo* or out of these localized keratoses. These changes are observed so often in seafaring men that the Germans have dubbed this stage "sailor's skin."

The most advanced illustration of this dermatitis actinica has been observed among the original x-ray workers, not the patients but the doctors and the manufacturers, and death has claimed many of these pioneers who have given up their lives in consequence of their unfortunate ignorance and zeal, while others are living today in delicate health, and crippled by the loss of one or many fingers, or even hands.

It is luckily well recognized today that the frequent worker with the x-ray must protect his skin well behind leaden screens if he would avoid the fate of his scientific predecessors. If he becomes careless, sooner or later he will perceive that his exposed skin is becoming reddened and then freckled, and that his hair is getting dry, and perhaps falling, and later that between the freckles the integument is growing white and thin and glazed and that little arborescent blood vessels are putting in an appearance. And later still, if this worker continues his unwise methods, he will observe rough, scaly, brown islands of skin, and in some weeks or months these isolated spots will grow hard and deep, and now he has developed cancer, often of a peculiarly malignant type. After this, ulcers form and scar tissue results, and then come the surgical operations—the ablations and amputations and deformities and disablements, and you know the rest.

I have described in detail the blasting effects of unfiltered x-rays because I have witnessed every one of these cruel changes in quite a number of instances, but the same degenerations may result from the unwise use of radium or the Kromayer lamp, or from other unprotected forms of light. In regard to the ill effects observed in radium workers, it is interesting to note the conclusions just published by Dr. Ordway, until recently the head of our neighboring Huntington Hospital. This author and practised worker states that the chief objective changes in the skin consist of flattening of the characteristic ridges, thickening and scaling of the superficial layers, and even atrophy and intractable ulceration. Subjectively, the results are even more important and trying. Tenderness, throbbing pain and various other modifications of sensation are noted, and as in x-ray accidents, are curiously obstinate to control and cure. Perhaps many of you have observed the strange figures sitting over our street railway tracks, helmeted and gloved, engaged in electric welding. Experience has taught these men what they must do to protect themselves. Strangely enough, there is a certain disease—fortunately one of our very rarest—where the victim is so susceptible to the actinic rays of the sun that all the various cutaneous degenerative gradations incident to repeated x-ray exposures are produced by mere existence in our everyday surroundings. We have observed at least seven of these miserable people in Boston—quite our share. The tendency naturally evinces itself in early life, and I remember one baby, taken out of doors for the first time in February, who became sunburned at once and then freckled and then developed the disease in all its hideousness. The actinic rays can produce another rare condition of the skin called hydroa aestivale, in which small water blisters form upon the ears and hands, and these peculiar individuals lead a handicapped existence, and may die in consequence of this strange idiosyncrasy.

DISEASES OF POSTURE.

The standing position, obligatory for so many of our wage-earners in trades and occupations, too numerous even to mention here, means, sooner or later, to a certain proportion of these men and women, varicose veins. I shall not speak of the pain and fatigue this common fault entails—that is not in my province today—but I must mention the ensuing deterioration of the neighboring skin and its consequent susceptibility to eczema and to bacterial infection—either of which misfortunes almost inevitably leads to the well-dreaded varicose ulcer—a condition which usually means weeks of incapacitation.

To the tuberculously inclined there is an added danger in the standing position, for young women of this type may acquire deep and painful nodes of the lower legs, which require, to effect a cure, months of the most favorable conditions of rest and hygiene, unless the patient is wise enough to submit at once to a surgical operation. This disease is known as erythema induratum.

There is one more disease of posture which should be mentioned before leaving this division of our subject. I refer to the calluses which tailors, cobblers and others acquire on parts of the body where there is constant pressure or where repeated blows fall.

VICTIMS OF INSECTS.

The occupations which expose men to the bites of insects are many, and the world is now cognizant of the fact that the bite of an insect may be a simple temporary incident or may carry in its train the germ of some fatal malady. Northern guides suffer most from mosquitoes, midges and black flies, and those of you who have been attacked by swarms of these pests can appreciate what these men have to endure in their daily lives, in fact a peculiarly susceptible individual may die in consequence.

Gangs of laborers, huddled together in ill-kept shacks without bathing facilities and without means of frequent changes of body linen, may soon become infected with lice, bedbugs, fleas, or itch mites. All of these insects produce their characteristic bites or diseases entailing great discomfort or suffering and consequent diminution in the working capacity of their victims. Our northern lumbermen are perhaps the most frequent victims, but any group of men, women or children living under similar conditions may suffer the same consequences, and we must not forget to include here the teachers, the policemen, the hospital attendants, the nurses or the doctors who examine or treat these patients or their clothes, and not infrequently become infected.

Within the past decade or more a new disease has been discovered, due to the presence in the skin of the poisoned, dart-like hairs of the caterpillars of the brown-tail moth. These imported pests have necessitated a great increase in our forestry work, and many men employed in this capacity have been poisoned not only by the living insects but by their leafy nests, which harbor the noxious material. Still more recently Dr. Schamberg of Philadelphia has been able to prove that a type of red and itching skin, observed in millers, farmers, and packers, is due to the presence of a small mite called the pediculoides ventricosus in the flour and straw which these men handle, and to this disease Dr. Schamberg has given the name of grain-itch.

THE RÔLE OF CERTAIN VEGETABLE PARASITES.

There are several groups of parasites, higher in the vegetable kingdom than bacteria, which now deserve our attention. The commonest of these, the hyphomycetes, produce diseases known as ringworm and favus. All classes of children are liable to become infected with ringworm, and the children of eastern Europeans and northern Italians bring favus to this country and frequently escape the usually vigilant eyes of our health inspectors. Those who care for such children, nurses, teachers, parents, doctors, are often infected with these diseases. Children are not the only conveyers of these organisms, for our common domestic animals, the dogs, cats, mice horses and cattle, harbor these plants and play an important part in their dissemination. Thus several large classes of men and women are affected—I refer to cat and dog fanciers, hostlers, coachmen, jockeys, farmers, cattlemen and veterinarians. As a rule, ringworm in the adult in this country is an unimportant malady, for it is easily detected and easily cured, but there is one exception, however, and that is in the case of the horse infection. The horse at times harbors a distinct variety of the plant, and unhappy is the man who becomes infected with this type of the disease, for within a few days the hairy parts of the face begin to swell and in the course of a week or two become a swollen, distorted, painful mass of abscesses, from which pus literally drops in really large quantities. There is, curiously enough, a redeeming feature to this strange infection,—it is short lived. The plant seems to require for its sustenance a certain substance known as keratin and this food the hair of the beard supplies. The inflammation resulting from the presence of this type of the plant is so severe that the ensuing pus is so extraordinarily profuse that the hairs are actually floated away from their attachments in the skin and lost, and the plant dies from lack of nourishment. The result is a rapid and spontaneous relief from what at first looks like a terrible and destructive disease. In the end quiet is restored, the hair reappears and there are no scars to tell the tale.

There is another and rather indefinite group which affects men engaged in certain agricultural pursuits or who live in parts of the country where agriculture flourishes. I refer to the families known as actinomyces, blastomyces and sporothrix, and men who plant and garner grain and men who tend or slaughter cattle infected with these organisms fall victims to these usually serious maladies. Many of you, perchance, have heard of the disease actinomycosis or lumpy jaw. Here men and cattle develop multiple abscesses in the skin and underlying tissues and perhaps the internal organs, especially the lungs, become involved and the unfortunate victims die. It is the same with the other families, the blastomyces and sporothrix. Here again men are attacked, and so long as the organisms remain limited to the skin the patients can live. The blastomyces produce rather vegetative forms of skin eruption—the skin becomes ulcerated and the surface uneven, and pus develops and thick crusts form and there is a red-purple halo about the ulcer. This condition is extremely rare in Boston, although we have encountered two such cases; but it is not uncommon in Chicago and in the great Middle West drained by the Mississippi and Missouri river systems.

BACTERIAL DISEASES.

The bacterial diseases play a very large and important rôle in certain occupations.

Boils, as you know, are produced by a very common bacterium with a very long name, the staphylococcus, and boils fall to the lot of many a workman. The machinist whose skin and clothes are permeated with dirty oil is frequently affected. The skin of the sugar maker, whose particular sphere lies in the superheated rooms of the factory, becomes moistened and consequently softened and therefore an easy prey to the entrance of this pus-making organism, and this is the case with any workman who spends his days in moist heat. The workers in aniline dyes, in mineral or metallic dust, in paraffin, in tar, and in chlorine gas are all liable to boils and are among the patients who consult us for this painful condition. Acute boils are painful but soon pass, but in some individuals, whose blood is not up to par, the disease becomes chronic and then life becomes trying and difficult and the ability to work becomes a question.

Tetanus or lockjaw at times falls to the lot of the man who digs much in country soil and to the carpenter or builder who may wound himself with rusty nails. The trench life of the present war has proved a fruitful source of infection to the soldier, and in the early days of the struggle many a poor man yielded up his life to this dread disease; but fortunately modern science has come to the aid of the present fighting man and to his peaceful brother and a special antitoxin, injected soon after the reception of a wound, means safety to the recipient.

Glanders, another often fatal disease, seems peculiarly associated with horses, and the man who tends them in any capacity is very liable to become infected whenever he comes in contact with such a diseased animal. There are so many varieties of livelihood gained by association with horses that this disease becomes an important occupational question.

Anthrax, or malignant pustule, a veritable scourge, lies in wait for the unfortunate victim whose occupation obliges him to handle the skins of animals. This seems to be peculiarly true of the hides and fleeces of our domestic animals and the freight handler, the wool sorter, or scourer or spinner, the tanner, the hair or bristle worker, the farmer and the butcher yield their annual quota to this dread disease. The spore of the germ of anthrax is most difficult to destroy, a fact which complicates the situation, and, in addition, no man has yet discovered an antidote to the poison. Curiously enough the greatest hope of cure lies in what in some other fields of human activity has fallen into obloquy—I mean watchful waiting. I shall never forget an experience of some ten years ago. I found in my hospital ward one morning a man in great pain. He sat propped up in bed and on his left breast was a large carbuncular looking mass the size of an orange. The center was black and crusted and surrounded by large, moist, bead-like, white pustules suggesting for all the world a giant brooch of hematite ringed by pearls. Beyond this the whole left chest and upper abdomen were swollen and hard and partly pink and partly blue—a most striking spectacle. The history was as follows: three morocco workers, to while away their lunch hour, made a ball of wet kid skin and passed it to one another. Within two or three days they fell ill and separated—one was treated at home and he died; one went to a hospital and the wound was laid open and he died; the third came to us and no knife touched him and he lived. This is not an isolated instance, for we at the Massachusetts General Hospital have recognized that surgical interference in these cases usually means death.

Tuberculosis is, as you know, a frequent occupational disease. The good Samaritan, be he relative, nurse or doctor, who spends much time in caring for tuberculous individuals, frequently falls a victim to the disease. The surgeon, the pathologist, the anatomist, and at times the medical student, may become infected in the finger or hand while working upon tubercular tissue. The butcher and the cowman are frequently infected in their close association with cattle. In fact, you see, many vocations may lead, sooner or later, to this unhappy result.

ANIMAL PARASITES.

There is one disease to be mentioned somewhat apart from the ordinary bacterial diseases because we believe the cause of the affection to be nearer to the animal kingdom than to the vegetable. This disease is syphilis. Within a few years you have been taught that the innocent as well as the guilty fall a prey to this malady, which in its manifold and various ramifications engulfs many a poor victim. We physicians have been gradually learning that a large group of diseases of the heart and blood vessels, of the kidneys, of the liver, of the spleen, of the brain and of the spinal cord are in truth due to an early infection of the syphilitic virus. This is comparatively new knowledge, for up to within a few years we limited, more or less, the ravages of the disease to the skin, the bones, the teeth, the eyes and the ears, and suspected somewhat the brain. Perhaps some of you are wondering why this affection is included among the occupational diseases. It is because those who surely deserve a better fate not infrequently acquire the disease in the discharge of their professional duty,—I mean doctors and dentists and nurses and wet nurses, and it seems a still stranger irony of fate that these men and women above all others should be hit the hardest. At least two of my former doctor patients are now dead of this disease. In addition to this medical group of victims, the glass blowers, who take turns in using the blowing instruments, are once in a while infected by a fellow workman.

DISEASES OF OBSCURE ANIMAL ORIGIN.

We have heard a great deal, especially in the last two years, of foot and mouth disease among animals. We have read in the papers of the many cattle and hogs which have become infected and been ruthlessly slaughtered. We have noted with regret the loss of whole herds of prize dairy cattle belonging to people, and especially to women who had made individual pets of these valuable animals. We all regret this senseless loss of animal life and wealth, but seemingly at present it can't be helped because foot and mouth disease is perhaps the most contagious of all diseases among animals. Here again you may be puzzled at the inclusion of this disease in this lecture. Here and there in affected districts men who have dealt with the diseased animals have developed a peculiar malady in which their bodies and the inside of their mouths are covered with great water blisters which come and come, and sooner or later the man dies mysteriously. This disease, ultra rare when associated with epidemics of foot and mouth plague, but more commonly observed among butchers (especially in England), who have not come in contact with this specific affection, has been observed and commented on once at the Massachusetts General Hospital by Dr. Bowen. Dermatologists the world over have hunted for the cause of this human infection. They have found in more than one instance a so-called diplococcus and again a peculiar bacillus, but as yet the medical world is unconvinced as to the precise organism at fault.

Once in a while in the warmer months of the year the dermatologist notes at the hospital, or more rarely at his office, a peculiar redness and puffiness of a finger or of a hand, which resembles erysipelas but is not accompanied by the systemic disturbance usually associated with that disease—I mean there is no fever, no headache, no loss of appetite and no nausea. This strange condition resembles also what is known as a septic hand, but this well-known infectious process is associated with the presence of some of the common pus organisms, while the rarer disease now under discussion does not seem to harbor any bacteria. This abnormal condition is termed erysipeloid, and we encounter it in the hands of men who have come in contact with animal matter, in short, we meet it in fishermen, in lobstermen, in crabbers, in butchers, and in poultry handlers. Dr. Gilchrist of Baltimore has made a careful investigation of the subject as observed in nearly three hundred instances in the crabbers of Chesapeake Bay, and has come to the conclusion that the disease is not a bacterial infection, but rather a poisoning by certain putrefactive products of the animal caught, killed or dressed—in other words, a localized ptomaine poisoning.

PLANT POISONING.

There are a good many plants, some of them very common, which cause trouble to the human skin. The list is rather a long one, containing some sixty or seventy individuals, and includes poison ivy, poison oak, and poison dogwood or sumac, several varieties of primroses, the nettle plant, the vanilla bean, the cashew nut, cowhage, smartweed, balm of Gilead, rue and certain lilies, and in fact when an individual has once become sensitized to plant poison an inflammatory reaction often results from contact with any plant with a sticky juice. Perhaps many of you in this audience have experienced the redness, swelling, and blistering associated with this distressing and at times temporarily crippling disease. It is, therefore unnecessary for me to refer to the rôle this condition may play in the lives of farmers, woodsmen, rural or suburban laborers and builders, nurserymen, and sellers of plants and flowers. It does not seem, therefore, out of place in this connection to sound once more a word of warning about the poisonous primroses. There used to be two kinds sold by our florists—the primula obconica and the primula sinensis. The former still deserves our attention because of the frequency of its victims. This plant was formerly easily identified by its large, dark green, spade-shaped leaf with its back covered with whitish, hairy spines; by its long slender, spine-covered stem; and by its cluster of small, lavender blossoms, six to eight in number. Nowadays identification has become difficult because florists have transformed the size and color of the leaf, the length of the stem and the size and color and number of the flowers; but the poisonous element has, unfortunately, not been eliminated. The law should forbid the future cultivation of this Chinese immigrant, but at present the rule adopted by the florists seems to be this; if the seller is not poisoned he continues to sell the plant; if the seller is susceptible to its venom he will no longer handle it and his customers are spared.

CHEMICAL IRRITATION.

We come now to the most important part, perhaps, of our theme, that is the great and frequent influence which chemical substances exert upon the men, women and children who, to earn a livelihood, are obliged to handle them. The number of cutaneous reactions produced is very numerous and too technical to describe; the list of chemicals capable of creating these damaging changes is too long even to enumerate, and the trades most often affected number between eighty and ninety to my own knowledge. The question then arises as to how this serious, almost everyday condition can be brought to your attention without wearying you by its very unwieldiness. I must, however, run this risk and take my chances with your patience.

The maker of acetylene gas may suffer from burns and ulcers due to the caustic lime in the calcium carbide.

The handler of denatured alcohol, and this means a large group of artisans, may suffer from eczema owing to the pyridine contained in methyl alcohol.

The aniline dye worker is liable to sweating of the hands, to redness, swelling and blisters of the skin, and to eczema as well, especially if he uses chlorinated lime to remove the traces of his day's work. Some years ago there was observed at the Massachusetts General Hospital, among members of the Boston Fire Department, a series of cases of skin poisoning which was easily laid at the door of a new issue of shirts dyed with aniline black. Blaschko, a German dermatologist, has recorded similar results after contact with fifteen different aniline colors.

The handler of arsenic, be he the producer, the furrier, the taxidermist, the leather worker, the sprayer of trees, or what not, may suffer from redness and dryness and consequent itching, from pigmentation, from "shingles," from ulcers, from cornification and from cancer.

The artist at times may owe his eczema to the turpentine and various pigments associated with his profession.

The baker has to contend with the possible presence in the flour of the grain mite, with the irritation of moist dough and of saccharin solutions, and with the great heat of his oven, and is a man who frequently consults us because of his eczema. Other handlers of flour,—the miller, the grocer, and the cook, should also be mentioned in this connection.

The barber is subjected to many forms of irritation, for his hands are used on all sorts of people, rubbing in various soaps with hot and cold water, and applying all manner of patented hair tonics. Eczema, therefore, is not an infrequent disturber of this man's peace, and sooner or later may oblige him to abandon his calling altogether.

The bar tender frequently consults us because of his eczema produced by the constant submersion of his hands in cold and dirty water and in multitudinous alcoholic slops. Then, too, the brass, which must glitter in his establishment, requires frequent polishing, and this duty only adds fuel to the flames.

The bleachers and cleaners are peculiarly prone to eczema, for benzine, chloride of lime, various acids and gasoline all remove the natural fats from the skin and dry skins are always unfortunately susceptible to disease.

The borax workers may become eczematized, and this is true of the producers, of scrubbing men and women and of laundresses.

Bricklayers and masons have an occupation which subjects them to the constant use of water, lime, cement and mortar in hot and in cold weather and causes them to fall victims to a most obstinate type of eczema.

Brushmakers must scour the bristles with strong alkalis, and cutaneous irritation follows in a certain proportion of those engaged in this work.

Bronze workers are prone to eczema and to boils on account of their intimate contact with the dust of copper, with hydrochloric acid, with antimony sulphide and with benzine.

Calico printers handle many dyeing, mordanting, bleaching and cauterizing elements, and their potassium and sodium chromates, chalk and stannic and acetic acids are notoriously eczematizing.

The candy maker is a very frequent victim of eczema, for the hot sugar which enters so largely into this occupation is a determined irritant of the skin. To an even greater extent does chocolate exert its pernicious influence on this group of sufferers, and the so-called chocolate dipper is a very frequent visitor to our skin clinics.

Canners owe their frequent attacks of eczema to the preservatives of the foods and to the ingredients used in sealing the tins.

Cabinet and piano makers, carpenters and in fact all wood workers, frequently ask us to cure their facial and manual eczemas. The resinous dust from many of the tropical woods, such as mahogany, rosewood, ebony, teak, satin and cococus; the variety of rhus which enters into the elements of the Chinese and Japanese lacquers, and the pyridin, shellac, and methyl alcohol of their varnishes, form a large group of especially irritating substances.

Makers and handlers of drugs and chemicals suffer much and frequently from their occupation. Eczema, boils, acne, gangrene, ulcers, cancers and other diseases owe their origin to prolonged and frequent contact with such substances as arsenic, calcium chloride, cantharides, carbolic acid, the caustic alkalis and acids, chlorine, bichromate of potash, formalin, iodoform, mercury, opium, and tar. In this class are to be included the doctors, dentists, medical students, nurses, hospital attendants, and undertakers, whose vocations require the frequent use of bichloride of mercury and formalin.

Chimney sweeps suffer from a peculiar type of cancer engendered by the tarry products of the soot which permeate their clothes and bodies.

Cloth handlers may become eczematized by irritating wool fibers and by the various dyes which color them.

Cooks, scullery maids, dishwashers, housemaids, laundresses, house cleaners, in fact all domestic servants, are peculiarly prone to eczema of the hands and arms, for their work is wet and dirty and washing soda and other chemicals are employed frequently to lighten their labors, but often the result is disastrous. The dishwashers frequently present a peculiar infection about the nails called paronychia, and until recently the orthodox Jewish women suffered especially because their religion, which fears pork in any form, forbade the use of soaps, the fats of which might contaminate their eating utensils. Now, fortunately, Kosher soap has solved the problem and we see much less of Yiddish paronychia.

Coopers employ caustic soda to wash their barrels, and this chemical, plus the ensuing solution of the paints, sooner or later causes eczema in the susceptible.

Electroplaters, who employ lime in the cleaning of their metals, cyanide of potash, sulphate of nickel, and chlorine in a nascent state in their plating, and sour beer in their "scratch brushing"; silver polishers, who, in their work, depend on a rouge consisting of mercury, iron and wax and upon cyanide of potash and bichromate of potash, and, in their finishing, employ a mixture of lime dust and olive oil; enamelers, who work constantly with various metals; and jewelers, whose work is somewhat similar to the others of this group, all follow trades which sooner or later may produce irritation of the skin.

Electric workers, who, day in and day out, subject their skins to lead, copper, brass, paraffin and various acids, fall a prey to these irritating substances.

Flax spinners suffer peculiarly from ulcers due to the constant handling of thread soaked in very hot water containing lactic and butyric acids.

Fruit preservers owe their frequent attacks of eczema to the irritating fruit acids and sugars and to the constant immersion of their hands in hot and cold water.

Furriers pay the penalties of their occupation more often than do most of their fellow workers. I have already spoken of the serious dangers of arsenic, and, in addition, these artisans may be affected by lime and by various dyes. It is not at all an infrequent occurrence for me to treat the victims of fur poisoning and the peculiar reddening and burning and itching and swelling of the skin at times are well nigh unbearable.

Galvanizers employ benzine, Vienna chalk and soap lye and dip their hands in the galvanizing baths and the results are frequently, temporarily at least, disabling.

Glass workers come in contact with copper sulphate and with hydrofluoric acid, and eczema often supervenes. The cementer of stained glass prepares and uses a substance composed of many eczematizing elements. This cement is compounded of ammonia, asphaltum, boiled oil, Portland cement, turpentine and whiting. What a list of offenders! It is no wonder that such a worker told me the other day that sooner or later, one by one, the men engaged in this particular division of the manufacture of stained glass had to be transferred to another branch of the work.

Gold refiners are irritated by cyanide of potash, and gilders are liable to a peculiar effect from turpentine which inflames their nostrils and gums and at times produces painful blisters and ulcers.

Hair dyers lead a life decidedly open to severe cutaneous irritation. The nitrate of silver and mercury and walnut juice of the older dyes and the paraphenylenediamin of the newer stains play havoc with susceptible skins, especially when they are moist, and the men and women who devote their lives to this sort of work must be really picked individuals, for not many weeks ever go by in my office without encountering some of the victims of hair dyes.

Hat makers suffer considerably from eczema, for fulminate of mercury, sulphuric acid, dirty water and the hair of animals are all irritating substances.

Men who handle hay, men who work with straw, men who use rushes of various sorts, may suffer from unusual infections resulting from possible contaminating moulds.

Ice cream makers and soda fountain employees suffer from the effects of cold, as I have mentioned earlier this afternoon, but contact with irritating fruit acids adds its share to the hazards of these forms of employment.

Lacquer work is notoriously irritating. The poisonous oil obtained from the Chinese and Japanese rhus sooner or later may give rise to eczema, swelling, fever, catarrh of the eyes and nose or a papular outbreak on the arms and legs.

Laundry men and women are subject to continuous exposure to hot and cold water, strong soaps, soda, chlorine and many cleansing fluids, any one of which is capable of causing mischief to those with susceptible skins.

Leather workers, and this term comprises the makers of many articles of trade and commerce, and includes, of course, the tanners, have been mentioned before as possible victims of malignant pustule, but they may fall a prey also to the effects of arsenic, hydrochloric acid, lime, bichromate of potash and of the dye aurantia in which they work.

Linoleum, which in its various forms is coming more and more into vogue, requires crude naphtha in its manufacture, and this substance causes trouble to some of its users.

Lithographers, who make use of formalin in their "sheet printing," ask our help from time to time on account of eczema.

Masons and plasterers pay their toll to heat and cold as already mentioned, but they have to contend also with the eczematizing character of the tools of their trade—the rough handles of their hammers, trowels and hods, made more irritating by the cutting edges of particles of granite and other hard stones. Then, too, their hands in winter are in cold water and in cement and lime and sand and hair, and the effects are often disastrous, as can be easily imagined.

Match makers deal with phosphorus and chromic acid and the sesquisulphide of sulphur, and these substances are very hard on those who handle them.

Machinists of all sorts have a common enemy in dirty oil, which is rubbed into and absorbed by the follicles of the skin, and if boils don't follow, eczema may. The necessary cleaning at the end of the day's work adds its quota to the harm to which these men's skins are subjected.

Metal workers, miners and smelters form another large class whose occupations subject them to many forms of irritation. Lead, mercury, copper, brass, bronze, antimony and arsenic are only a few of the more common minerals which produce various types of skin disease, but the concomitant dust, filings, acids, turpentine, etc., all form still further irritating adjuncts to these brands of human activity.

Mother-of-pearl, owing to its very fine, hard and gritty dust, produces a good deal of eczema.

Musicians, curiously enough, are subject to certain skin diseases. The persistent piano player at times produces calluses on his fingers; the violinist, 'cellist and harpist and zither player follow his example; and the player of wind instruments may develop pressure symptoms on his lips. It was my ill fortune to observe recently a cancer on the lip of a saxophone player from this very cause, and this regrettable and serious condition represents, naturally, the extreme and fortunately rare limit of mischief which this constant daily pressure can produce.

Painters lead a really hazardous life. We are not concerned this afternoon with the evils of lead poisoning, but we must speak of the many cutaneous irritants of the painter's trade. In their white-washing their hands are soaked in water and lime and frequently irritated by the dirty accumulations of years which they remove from the walls. In their painting their skins come in contact with many poisonous mineral coloring matters, with grease and oils, and with turpentine, shellac, varnish and methyl alcohol. In the cleaning of painted walls and shellacked floors the modern patented fluids are full of potash and irritating oils. This makes a truly formidable list of enemies for any one group of men to withstand.

Paper hangers are subject to the irritating aniline dyes of their papers and to the harmful effects of the glues of their pastes. Fortunately for these men arsenic has been practically eliminated from their wares.

Paraffin workers seem to be peculiarly prone to skin diseases. The substance harbors, as you know, many provoking ingredients, mostly mineral oils, and constant contact with this medium, with the consequent impregnation of the clothes, may produce eczema, pustules, and in the end cutaneous cancer.

Paste, as just mentioned, contains glue, and consequently its makers and handlers may suffer from eczema.

Photography is a profession which supplies many a victim to the class of skin diseases we are now considering at such length. Metol, a comparatively recent developer, is a most common malefactor and bichromate of potash and of ammonium and pyrogallic acid are not much behind in their mischief-making qualities.

Physicians, and let us include here all those who handle and care for the sick, lead a decidedly hazardous existence. I have alluded before to the various forms of bacterial and animal life which beset the paths of medical men and women, but now we are concerned with chemical forms of cutaneous irritation. The constant washing of the hands, often with so harsh a substance as green soap, and the necessary use of chemicals, such as bichloride of mercury, tincture of iodine, alcohol, carbolic acid and especially formalin, lead to constant recurrence of eczema to such an extent that some of these victims are obliged to abandon a profession the preparation for which has cost years of time and hundreds and even thousands of dollars.

Porcelain makers have much to do with turpentine, and you have noted this afternoon, perhaps, how often this substance enters into the various arts and have appreciated also its baleful influence on the human skin.

Printers engage in a trade notoriously trying to the skin. The lead of the type impregnates itself into the skin, and, owing to the danger of leaving this poison undisturbed, the man must clean his hands thoroughly before every meal. This process requires strong applications. Then, too, the preparation and subsequent cleaning of the type demands the use at one time or another of lye, oils, benzine, turpentine, acids and strong soaps—all mischievous articles with which we have now become familiar.

Stone cutters, be they the producers of the raw blocks at the quarries, the stone masons who help erect our buildings, or the sculptors who fashion our statues, suffer from the heavy work of their trade in their resultant calluses, from the sharp, cutting particles of stone which penetrate and subsequently poison the skin, and from the extremely irritating work of stone polishing.

Rubber workers, in one or more of the various steps in the manufacture of the raw material or of the many finished products, fall victims to eczema. The use of naphtha in all processes is most common, and the finisher uses a compound of benzine, shellac and ammonia,—a combination which drives many a patient to a skin doctor.

The miners of salt may suffer from ulcers, while men who handle salt, such as picklers, curers of fish and sausages, and ice cream makers, are liable to a peculiarly painful type of eczema.

The maker of shoes is a frequent sufferer from eczema due to the handling of leather (often very dirty), naphtha, soap and the chemical shoe polishes.

Sugar as a skin irritant has been implicated before in our reference to candy makers, but the manufacturer of the pure article suffers much from eczema, impetigo contagiosa, boils, lymphangitis, and sore finger nails. These various diseases owe their appearance to the possible presence of the sugar mite, to the inherent qualities of molasses and sugar, and to the great heat which is apparently necessary in certain steps of the making.

Tar handlers in the many and various phases of the term are peculiarly liable to skin diseases. Tar is used at times by physicians for its good effects in certain specific conditions, but this same substance is capable of great harm when brought in contact with the skin over too long periods of time. Pustules and acne are the first danger signals, and then come warts, various thickenings of the horny layer of the integument and finally cancers. We have noted this possible contingency before in speaking of chimney sweeps and paraffin handlers.

Tobacco workers come to our notice quite often suffering from eczema of the fingers and hands. The tobacco leaf in itself is in all probability irritating to the susceptible skin, but in the process of manufacture certain caustics and the waters of fermentation add their quota of mischief to the original irritant.

This, then, closes my long résumé of the subject, and, looking back over these many subdivisions of the question, we may note that 46 or more diseases have been mentioned, apportioned among approximately 120 different occupations. This is rather a discomforting disclosure to us perhaps, especially when we stop to consider that the past hour has been devoted only to diseases of the skin. However, we cannot dodge the truth of the foregoing remarks, for they are well recognized by men who have studied the matter conscientiously, and I personally have observed all but one of the diseases and have treated in all probability representatives of a very large proportion of the many occupations.

Let us not assume, however, that these diseases fall to the lot of all men and women who engage in these multifarious pursuits. That would be absurd; for if that were the case many of us here now would be at home nursing a damaged or diseased skin.

What, then, is the truth? There are no available statistics covering the whole subject of occupational skin diseases, but in the case of eczema we have more or less reliable figures. Knowles of Philadelphia reckons that one quarter of the cases of eczema which he treats are directly attributable to the occupation of the patient; Hazen of Washington computes the percentage at one-fifth, and Oppenheim, a German writer, makes the figures four-eighteenths; all three observers, you will perceive, in substantial agreement.

Granting, therefore, that a certain proportion of the community is susceptible to the dangers inherent in its chosen occupation, cannot anything be done to mitigate or possibly to abolish these dangers? My answer is a strong affirmative. How, then, can this highly desirable result be obtained? Mainly through the education of the employer and the employed. I for one do not believe that the average employer of labor is a brute and a tyrant, because, in the first place, in these days of keen competition it is not for his interest in any way to have his men incapacitated. One great object in the present intensive study of occupational diseases is to teach the employer in every possible way how to safeguard the health of those in his employ, and this purpose is slowly but surely being evolved. On the other hand, the splendid modern science of preventive medicine is gaining fresh impetus every day, and the results from the employee's point of view are already bearing fruit. We physicians, who spend our lives among contagious and often dangerous diseases, are fortunately usually spared from sharing the fate of our patients, mainly by our knowledge of self-protection, and this same knowledge must be disseminated among all classes of our fellow-beings. That is what I mean, therefore, when I speak of a campaign of education; this is my purpose in appearing before you this afternoon; and this is the object the Harvard Medical School has in view in conducting over these several past years these series of free popular lectures.

LEONARDO DA VINCI'S SCIENTIFIC RESEARCH, WITH PARTICULAR REFERENCE TO HIS INVESTIGATIONS OF THE VASCULAR SYSTEM.*

BY ARNOLD C. KLEBS, M.D., WASHINGTON, D. C.

(*Concluded from page 7.*)

With such an equipment, differing not essentially from our own, it is natural that Leonardo's findings had to be in advance of his time. For him "the heart is a muscle, the first in strength and the most potential among the other muscles." The ventricular as well as the auricular walls have transversal, longitudinal and oblique muscle fibres. He distinguishes the base and apex as we do, is aware that the base with fibrous, cartilaginous, osseous elements (the latter in animals) forms the more solid part of the structure, with which the more mobile elements, muscle fibres and valves are connected. He distinguishes the two ventricles and the two auricles, and he notes with precision their different shapes and the thickness of their walls. The septum is thinnest at the base and thickest at the apex. His conception of the septum, that part which has exerted probably the most important obstacle to a correct understanding of the cardiac function, naturally incites one's greatest curiosity, and it must be said that in the great number of representations Leonardo gives of it in various aspects, it does not appear materially different from what we know it to be. This is astonishing because in two or three places he speaks unmistakably about the penetrability of the septum in the Galenic sense, he names it the "cholatorio" of the blood, *i.e.* a colander, a strainer, but nowhere, not even in his schematic sketches, where one would especially expect it, does he show openings between the two ventricles.* The question arises: what represents Leonardo's state of knowledge about this matter, his drawings or his words? A careful student of the manuscripts will be struck to find some expressions which could not possibly represent Leonardo's view, and still they stand there without any commentary. And then one will find elsewhere the opposite view expressed, sometimes with direct reference to his own observations, the object of which may be further illuminated by a sketch. This gives one the impression that those improbable versions Leonardo perhaps put down on paper as a tentative proposition, a working hypothesis for further reference, and verification, and possibly derived from his book study. There are many other memoranda, the true nature and purposes of which are self-evident and therefore the supposition in this case may be allowed, viz., that Leonardo, although he observed the solidity of the septum in the organs before him, noted down references to the literature. This reminds one somewhat of Vesalius' statement in the first edition (1543) of the Fabrica on this same subject, where he says that, although he did not find the holes, he, nevertheless, had to admire the Creator's skill which allowed the blood to sweat from the right into the left ventricle "through openings escaping the eye" (meatus visum fugentes). Sir Michael Foster, as you perhaps remember, considers this reservation as an ironical sneer, in no way an expression of doubt as to the solidity of the septum, but in view of the lengthy explanation which Vesalius gives of the same subject in the second edition twelve years later, his former statement may well be taken as an expression of uncertainty. Servetus' statement (1553) made between the two years, much more positive, may well have influenced him. As regards Leonardo, I may add that in one of his observations, undoubtedly his own here, he notes that he had found in one adult an opening (foramen ovale) in the auricular septum, and to be on the look-out for similar occurrences in other autopsies.

Leonardo's pictures of the external aspects of the heart are the best of his representations of organs; they might be compared with some modern ones, but with nothing from earlier periods. They have been criticized as not representing correctly the objects and also showing false relationship with adjoining organs (lungs, trachea). Both groups of objections are based on the presumption that Leonardo depicted human hearts, while it is clear that, particularly for the representation of the external features, he used bovine hearts and that he drew them perfectly correctly. As regards the correlation *in situ* it is true that there are several drawings which are evidently reconstructions by means of several drawings, which were derived partly from human, partly from animal objects. So in the much-admired large picture of a female situs, which must be considered as a most brilliant attempt at transparent anatomy, Leonardo draws the aortic arch situated in front of the left bronchus and below the bifurcation of the trachea, and from it issuing one large artery instead of three,* all conditions found in bovines. It is clear that such a transposition of animal

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[*] In some sketches of sections through the septum, there appear on one side fine dots or short lines, but they do not reach to the other side. In the drawing of one square piece of the septum which shows on the upper and only visible side the unevenness of the surface, there appear on the cross-section several longer fine lines which, however, do not penetrate either (see Quaderni II, fol. 3 recto).

[*] Elsewhere (Feuillets B, 33 recto) Leonardo shows the conditions as found in man, probably after he had had occasion to compare his earlier findings with those exhibited in a human autopsy.

anatomy into what purports to demonstrate human conditions is most misleading to the student, but in Leonardo's case it does not discredit the soundness of his actual knowledge any more than that of Vesalius' for drawing into his human figures the scaleni and recti muscles borrowed from dog anatomy. Leonardo did not intend his pictures for didactic purposes, and it is certainly more important to note that he drew correctly the junction of the vena azygos with the vena cava superior, also that of the venae spermaticae, the origin of both right and left arteriae sperm. int., and the relation of the ramifications of the hepatic blood vessels in the hilus of the liver to those of the hepatic veins in the liver itself, all conditions unknown in Leonardo's time (Holl, Quad. I, p. 80). Very lucid is his representation of the coronary vessels—"vessels which nourish the heart"—; he clearly distinguishes arteries from veins, they are uncovered except by a membrane ("*pannicolo*" sc. visceral pericardium). The artery lies deeper than the vein in general. In one view (Quad. II, 4 recto 9) one sees the origin of the two coronary arteries, their branches to the left and right of the pulmonary artery, the descending one of the right coronary artery running along the border of the right ventricle, this method of representation resembling much that employed in Henle's angiology (Fig. 1). In another view (Quad. II, 4 recto 3) we can follow the posterior vein of the left ventricle, the branches of the vena cordis media, the end of the vena cordis magna and its junction as coronary sinus with the inferior vena cava (Holl, Quad. II, p. 251). The whole coronary system is thus very well studied (Fig. 3).

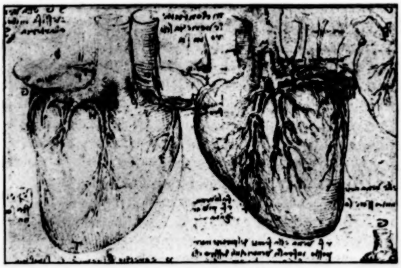

FIG. 3.—One of Leonardo's many studies of the coronary vessels. Arteries are clearly distinguished from veins (A. cor. sin., V. cord. magn. and media). (from Quad. II. fol. 4r.)

The great vessels, both those issuing from or entering into the heart, on the whole, are well to be distinguished in these external views, in some they are left as short stumps, in others the aorta or pulmonary artery are cut off just above the valves. The absence of a marked conus arteriosus and of distinct auricular sinuses, which appear only as smaller dilated ends of the venae cavae or as auricular pouches at the entrance of the pulmonary veins, is rather striking, but corresponds to the conditions found in bovines (Fig. 1). Not very clearly given is the entrance of the pulmonary veins into the heart (Fig. 4).

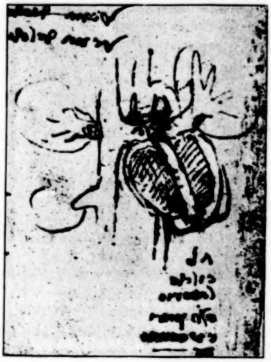

FIG. 4.—Apparently the only sketch of L. in which he indicates course and relation of pulm. veins together with those of VV. cavae. Note also "cholatorio" of septum. (from Quad. II. fol. 2v.)

In one view they appear as a common trunk descending into the left ventricle with an auricular pouch, in another as two large vessels joining just before their entrance into the heart (Quad. II, 3 verso). But there cannot be any doubt about Leonardo's solid knowledge of all the parts of the heart, only as he examines them always with a view to their function, it is somewhat difficult to analyze them in the purely descriptive manner which modern anatomic research demands. Especially when it comes to an examination of Leonardo's conception of the valvular apparatus is it necessary to proceed in his own manner. Let us, therefore, see how he distinguishes the two sides of the heart. "The left* ventricle has two orifices, one in the *vena aorta,* opening from within outwards, the other orifice is in the *arteria venalis* and goes from the heart to the lung, and has a single coat and is named arteria because of the thin (sottile) blood, and venal because of the simple vein (single coat)." On the same page we find the description of the right side, thus referring to his drawing: "—the gate of the lung (porta del polmone) and it is named *vena arterialis;* it is named vena, because it conveys the blood to the lung, and arterialis because it has two coats; and it has three valves (tre porte), which open from inside outward, with perfect tightness (perfecto serramento), and these are in the right ventricle. *a* the gate of the *vena cava* (vena chilj)." If we substitute for the Galenic terms, *i.e.* "arteria venalis and vena arterialis" our modern ones "pulmonary vein and artery"; for "vena aorta" and "vena chilj," respectively aorta and vena cava, remembering always that "vena" stood for "blood vessel" generally, while "arteria" signified literally then, as it does today, "air-tube," we have in the above a description corresponding to actual conditions. Leonardo also proceeds to a very painstaking examination of the valvular apparatus, to which he devotes several pages, one inscribed "Geography of the heart" (Quad. II, fol. 8 verso). Here again is strikingly apparent his mastery as a preparator and draughtsman. His examination embraces a careful scrutiny of all the component parts of the valves, separated, put together and *in situ*. One has the distinct impression that nothing escapes him and that he notes everything, and in passing I may call attention to one interesting discovery of his which was rediscovered only in our times. I mean certain muscle bundles or bands which traverse the ventricle from the ventricular wall to the septum, now usually described as "moderator bands" (Fig. 5). Leonardo was evidently much interested in these structures, as he draws them frequently in various aspects, and also in concordance with modern views he sees their function in the prevention of ventricular overdistention,[*] also interesting because of the great physiological and clinical significance only recently ascribed to the auriculo-ventricular bundles of His, which send branches into these bands of Leonardo's.[*] To return to the valvular apparatus proper, it is obviously impossible to do justice to Leonardo's representation of them without going to very great lengths, and especially without an inspection of his many drawings. Most interesting and instructive is his preparation and demonstration of the tricuspid (Quad. II, fol. 3 recto and 8 verso). He dissects the whole valve from the underlying muscle, so that it appears unrolled in one plane or projection similar to that first employed in cosmographic projection by Mercator in 1550 (Fig. 6). We distinguish, issuing from the *columnae carneae* the papillary muscles, their *chordae tendineae* with their attachments to the cusps. The parts adjoining the septum and walls of the ventricle are indicated so that their position *in situ* is clear. "Join them together again," he notes with this drawing, "in the way they stand when the right ventricle shuts itself and then you will see the true shape of the valves how they do with their chordae when they shut themselves." And this is again illustrated in most original manner. In one picture we see the closed valve from the side of the ventricle, in the other from the atrium (Fig. 7). The mitral valve is studied in the same thorough manner as are also the semilunar valves as already alluded to above. The manner in which the aortic valve is shut engages Leonardo in various drawings. He studies the blood stream entering the aorta, the vortices which

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* Leonardo writes here "right" evidently by mistake for "left", because in the same sentence he speaks of the aorta as issuing here (Quad. II, 2 verso).

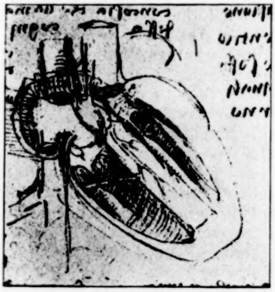

FIG. 5.—One of many sketches showing the transverse muscle band. Note also indication of different thickness of ventricular walls. (from Quad. II. fol. 14r.)

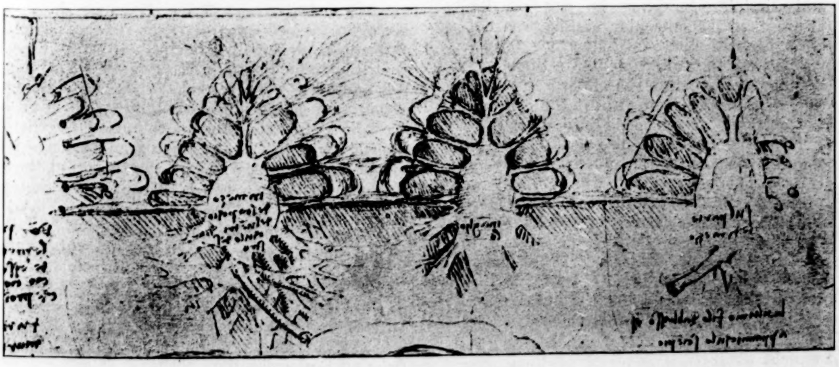

FIG. 6.—"Geography of the heart." Inscriptions on the pap. muscles from left to right: "Middle of r. ventricular wall, corner, midwall." Note band which stretches from trabec. carn. on left to septum on right, also excellent representation of insertion of chord. tend. to cusps. (from Quad. II. fol. 8v.)

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[*] "Li muscoli ramifichantj . . . servano a non lassciare dilatare il core piû che il dovere." (Quad. II, p. 12, fol. 4 verso V); in another note he speaks of them as "catena", i.e. brake (Quad. IV, p. 13). It must be noted here that these bands are much more distinct and also longer in bovines than in man, where they sometimes do not even exist as isolated bands. Holl, who has lately called attention to this discovery of Leonardo's, proposes to have these structures named after Leonardo, a good suggestion seconded by Sudhoff. (Quad. II, 8 verso, Figs. 1, 2, 3; 10 recto and elsewhere, also Quad. IV, p. 13.)

form beyond the valve and in the sinus Valsalvae, distending and adapting the segments of the valve. To get a clearer picture of the valve he makes a cast of it in wax (Fig. 2, see page 6); he also seems to have used, or at least projected, a model of this region, a tube with a dilated portion so arranged that he could observe through a glass window the behavior of a fluid in motion. By these means he demonstrates how the shock of the vortices, as well as that of the whole blood column in the aorta upon the closure of the valve, have to be borne, not solely by the valvular segments, but also by the adjoining parts of the ventricle and the walls of the aorta in the sinus Valsalvae, thus preventing rupture.

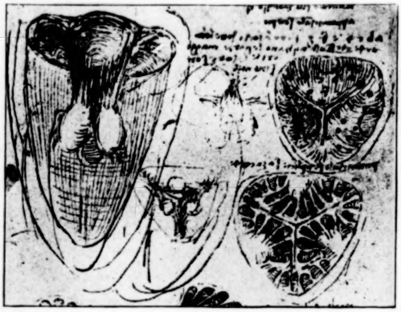

Fig. 7.—Inscription reads: "Simple valve without chordae—valve seen from inside." (from Quad. II. fol. 8v.)

The function of the heart as a propulsing motor for the blood is also very fully gone into. Horizontal cross sections through the heart, as well as longitudinal ones, are drawn (Quad. II, 4 verso. and Rav. Moll. Mss. G. I verso) during systole and diastole. From these drawings and accompanying notes it is evident that he understood perfectly the rôle of the ventricular systole and diastole; moreover, he was equally well aware that the auricular systole was not synchronous with the ventricular one (Quad. f. 4 v.) but that they alternated. On the other hand, he knew the synchronism of the ventricular systole, of the heart beat against the chest wall, of the entrance of the blood into the auricle and that of the arterial pulse beat; also that the sound produced by the shutting of the valve is transmitted through all the arteries to the periphery, and sometimes can be perceived in the ear. He attempts to fix the rhythm of the heart contractions: "after the systole follows the diastole in two-thirds of a harmonic (musical) tempo" (Quad. II, 11 recto, IV), and in measuring the velocity of the blood current—a modern physiological problem—he realizes that it is inversely proportional to the calibre of the vessels.

Before I attempt to sum up Leonardo's concepts about the blood current in general it is necessary to survey briefly some of his findings in the lungs and in the general vascular system. Leonardo, here as elsewhere, proceeds by objective investigation and experiment, a fact which must be borne in mind when considering this survey, which is apodictic for briefness' sake only. The lung, the form and divisions of which he describes in detail, is an elastic organ, which adapts itself exactly (Quad. IV, 3 recto) to the chest walls and the diaphragm.* It expands in every direction but more downwards "because more useful for the expulsion of food from the stomach." "The freshness of the air, entering the lung is taken up by the arteries, which are in continuous contact with the ramifications of the bronchi throughout the lung" (Quad. II, 11 recto), he gives a very interesting sketch, showing the relation of blood vessels and bronchi (Quad. II, fol. 1 verso). Near this picture are the following words: "To me it seems impossible that any air can penetrate into the heart through the bronchi,"† and he proceeds: ". . . the bronchi (trachea) ramify, dividing into minutest branches, together with the minutest ramifications of the blood vessels (vene), which accompany them in closest contact to the end." And then he asks himself, after having above excluded the possibility of the air entering the heart from the trachea and from its ramifications, whether "here the air enclosed in this (the terminal bronchi) blows ('spiri') through the fine branches, entering into the smallest branches of those veins." The final result of this highly interesting inquiry we do not know. He speaks of terminal bulgings of the bronchi, which Holl seems inclined to consider as a primitive conception of the alveoli, but the important thing is that the lung as a respiratory organ is correctly conceived by Leonardo as a distinct anatomic unit, the bronchial tree with its blind ending branches in closest contact with the blood vessels (Fig. 8). We see that he places the interrogation mark at the very point where only some new technical device (microscope) can give the answer. As regards the general vascular system his drawings show, as elsewhere, excellent dissection of the objects, faithful rendering in drawing and a good conception of the relations between the blood vessels and the various organs. So we find his representation of the portal venous system in good accord with conditions found.‡ Excellent knowledge betokens his picture of the arterial and venous ramifications in the liver and those of the hepatic duct, which he represents issuing from the hilus and connected with the cystic duct from the gall-bladder.

The question now naturally occurs: What did

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* S. a. Quad. II, fol. 1, recto, paragraph 6, where he speaks of inspiration of the lung: "and never does it burst, as it never fills itself entirely with the air," plain words for an important physiologic concept.

† "Trachea" in the text, but the sense is evident. To be noted is particularly the lacking distinction here made between air-conveying and blood-carrying vessels, although in the same paragraph he says clearly: "The lung cannot send air into the heart," giving his reasons why it is not necessary that it should.

‡ Except for one short venous trunk from Vena cava inferior as junction point for the portal vein and the vena lienalis (Holl).

Leonardo know of the circulation of the blood as this phenomenon now stands in our conceptions? By students of Leonardo's manuscripts it has been variously answered. Holl, the most eminent and painstaking among them, holds the conservative point of view, believing that the material in hand does not allow a definite statement; that Leonardo was, however, on the right road. Boruttau, Roth and others, judging mainly from Leonardo's text, believe that he had not even a primitive notion of the subject and similarly opinions undulate between excessive affirmation and complete negation. It seems to me that it is *au fond* entirely irrelevant whether Leonardo thought on this subject as we do or not. In this matter, as in so many, we forget that the concept of the circulation of the blood is not a final, eternal one, but simply the best working hypothesis, at the present moment, for our purposes as we understand them, and which again are not immutable in larger human experience. But while we have no other measure than our concepts of today for those of yesterday, it is well to remember that Leonardo's definitive views on this subject are not before us for scrutiny. Fragmentary, unconnected (or at least not systematically connected) observations in a life's experience which in itself is fragmentary, as far as our knowledge of it is concerned. Take these sheets that we are analyzing to find Leonardo's final concepts and compare them to loose sheets torn out indiscriminately from the laboratory records of a modern worker, a Pasteur, a Koch, for instance. That illustrates the difficulties in store for us. But with all these difficulties we can see enough of Leonardo's method of procedure and the stages of his knowledge to realize that he was far ahead of anyone at his time, but that by it and through it he had to come essentially to conclusions very similar, if not identical, to ours. Two errors of his time stood in Leonardo's way toward a conception of the circulation,—the penetrability of the septum and the conveyance of air through the arterial system. The conclusion drawn was that the right heart conveyed the blood to the organs it nourished, receiving it back again by the same route it had taken, while the left heart, receiving the vital principle from the lungs and partly through the septum from the right heart, distributed it to the brain and all the other parts of the body by means of the arteries. Now let us take the essence of this teaching which had reached Leonardo from Aristotle, through the Alexandrians and Galen and their numerous commentators. The heart is the central organ of propulsion, from it the blood is actively thrown into all the parts of the body which it nourishes and these same parts are vivified by something conveyed to them by the arteries. (For the present it does not matter whether the blood originates in the liver, or the heart or elsewhere). As a working hypothesis this conception is quite acceptable, and the one thing that troubles us most is that "vital principle," for with it arise in our memories those different kinds of spirits, natural, vital and animal, which we like to convey into a museum of ancient superstitions or of mediaeval demonology. But did not our great Harvey say: "*neque sanguis sine spiritu sanguis est, sed aequivoca et cruor,*" just as a stony, dead hand is not really a hand: so "nec sanguis sine spiritu vitalis sanguis (Letter to Riolanus, 1649, p. 117), and did he not also frequently allude to its astral relation, as, for instance, in: *spiritus nempe et natura in eo spiritu respondens elemento stellarum.* And still we are all agreed that Harvey did discover the circulation. But Harvey came with his discovery one hundred years after Leonardo was dead, and for him the *spiritus in sangue* might be conceded to be a *façon de parler* for our oxygen. Let us go back a little to the genial discoverer of the lesser circulation—

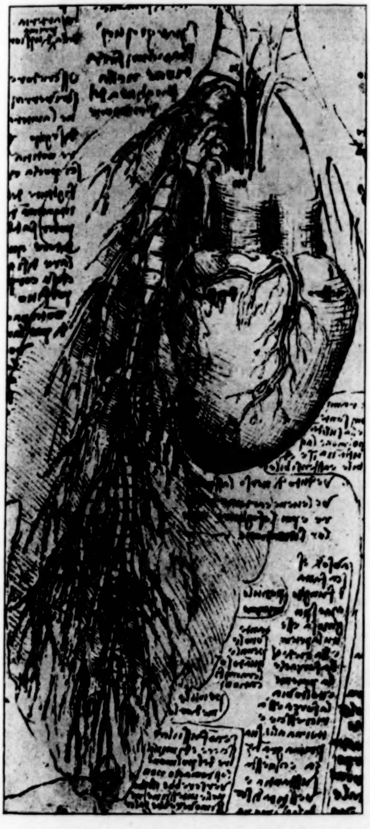

Fig. 8.—Most interesting representation (schematic but not phantastic) of the bronchial tree with blood-vessels. Note the circumscribed area in lowest part of lung. L. describes it as an incapsulated focus of detritus: "Nature avoids the breaking of the tracheal ramifications. (from Quad. II. fol. 1r.)

which, as you remember, Huxley does not grant to be a circulation any more than he would apply that term to a walk from his door to that of his neighbors—to Servetus, who puts it: "*Primus spiritus ergo est sanguis.*" You see the shifting of terms: the *sanguineous spiritus* here to the "spirituous blood" of Harvey. We can follow this same concept through all the historical competitors for Harvey's place,—Vesalius, Realdo-Colombo, Cesalpino, Ruini, Sarpi and the vast mediaeval and Renaissance literature, a reminiscence from Alexandria, which produced that troublesome concept of the "*pneuma,*" that "aeriform fluid" conveyer of sensation and nourishment that no one, including Galen, well understood, but nevertheless commented, dilated and "improved" upon, thereby clouding the more rational concept of the great Aristotle. The intellectual visions produced were the air-filled arteries, which every barber in Alexandria and elsewhere knew to spurt blood on incision, but which none-the-less held their sway in untroubled spiritual airiness throughout succesive learned books copied from each other. It must be presumed that in those times, as in ours, there were sober men who read between the lines as well as on them, and who compared reality with literature, knowing the truth even if they had not the means to express it, or perhaps because they had not. A man, extremely proficient in hydraulics, theoretically as well as practically, Leonardo who wrote (Rav. Moll. Mss. H. 101 verso): "The water which from the extreme profundity of the sea rises through the strength of its motor to the heights of the mountain, finds there open veins, enters them, returning by the shortest way to the deeper sea ."*ramificante vene*" again to rise. . . forwards and backwards. . . "*moto girando*"—could he really have completely ignored the course of the blood current in the body? It is on this point that we have from his hand no definite and sometimes contradictory information. We cannot entirely ignore his statements about the direct communication between the ventricles, neither his reference to the flow and ebb of the blood, but it is entirely permissible to consider such expressions not as conclusive, even if we do not find contrary views definitively stated. At any rate, wherever he mentions the flow and ebb motion of the blood both the ventricles and auricles are considered the motive force behind it (Quad. I, 7 recto) and although he nowhere describes the exact route by which the blood returns to the heart from the lungs after having described correctly the path it took from the heart into the finest ramifications of the pulmonary vein, it is significant that he asks the question: "Whether the vessels of the lungs do not send the blood back to the heart, when they contract to expulse the air?" Another sheet, one of the many lost, may have contained an answer which would have made clearer a further advance, such as his drawings, considered by themselves, allow us to suppose that he must have reached. Being unable to assert with certitude what conclusion on this subject, as on others, Leonardo reached, it is, nevertheless, clear that he pursued methods of research essentially the same as ours. He did not publish these methods and conclusions in the conventional way, but we know that there were many other ways open by which he could reach his contemporaries. His teaching in his academy in Milan and the dissemination of his manuscripts, their frequent perusal by others, even during his lifetime, must have encountered receptive minds. So we study in him the silent, unheralded influence in the search after truth by the accident of the discovery of his manuscripts. His work and similar other influences fill the gaps in our historic perception, and I see herein their main significance, that by their realization we get a truer picture of the continuity of the evolution of scientific thought. And what makes the personality of Leonardo so interesting and sympathetic to us is not measurable by the close approximation of his anatomic and physiologic knowledge to ours, it lies much more in the identity of procedure in his scientific inquiry. He is much more like one of us than any of the brilliant row of scientific celebrities of past centuries whose prejudices we cannot understand. But, while identical as far as scientific procedure is concerned, I believe there are some elements in his wider aim, in his emancipation from too close specialization, where he might well teach us many things, the appreciation of which may well be left to each one of us, according to our individual lights.

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NOTE.—Most of Leonardo's anatomical and physiological legacy is contained in 1, 2 and 3 of the above editions. Of these: 1 and 2 duplicate the facsimiles in 3, providing them with translations; therefore, when 2 is once completed 3 will become obsolete, but not 1, a fact sometimes overlooked. The editions 4 and 5 contain but little anatomy, but natural sciences and physiological optics. There are, furthermore, four or five other facsimile editions of extant Leonardo MSs., but they contain hardly any anatomy.

The literature on Leonardo's anatomy has already reached considerable proportions. References to it are to be found under "da Vinci" in Vol. XX, second series, Catalogue of the Surgeon General's Library, 1915. To Prof. Holl's reviews of the Quaderni, which have appeared from 1911 to 1915 in the Archiv für Anatomie, etc., the author acknowledges his special indebtedness.

A. C. K.

Original Articles.

HEMATOCELE OF THE TUNICA VAGINALIS, WITH THE REPORT OF AN UNUSUAL CASE.*

By Charles M. Whitney, M.D., Boston,

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Hematocele signifies, from its derivation, a blood tumor and may occur in various parts of the body, but in genito-urinary practice, it indicates a collection of blood in the cavity of the tunica vaginalis, or in some pathologic, intrascrotal cyst.

According to the causes which produce it, this condition may be acute or chronic, for each type has its own peculiar, etiologic factors. An acute hematocele may be followed by a chronic one, but is not always, while one of the chronic type may be so from the start, and not preceded by an acute manifestation.

Strictly speaking an hematocele should mean an effusion of blood in the cavity of a normal tunica vaginalis, and when this occurs in other sacs, hydrocele, spermatocele and the like, it should be described as a hydrocele with blood or a spermatocele with blood, but it is more convenient to apply the term hematocele to all intrascrotal sacs which contain blood.

Clinically, therefore, the subject is divided into the primary form, where the blood effusion takes place in a normal tunica vaginalis, and the secondary, where the blood is mixed with the contents of other and pathologic sacs. This latter form is relatively the most frequently seen, and it may be well to consider it first and to review the causes which produce it.

First in frequency of this variety is the effusion of blood in a hydrocele.

A greater or less collection of fluid having taken place in the cavity of the tunica vaginalis, a sac is formed, the walls of which are distended in varying degrees, according to the amount of fluid contents. A blow or fall upon this distended sac meets with the increased resistance of the fluid, a rupture of the blood vessels of the walls of the tunica vaginalis occurs, and a varying quantity of blood is poured out and is mixed with the hydrocele fluid.

As a rule, there is extensive ecchymosis of the skin of the scrotum which is gradually absorbed. If the quantity of blood which escapes into the hydrocele is small, as it usually is, there may be no great increase in its size, but it pursues its normal increase as more fluid is secreted from its walls and it is only when it is tapped that we discover the presence of blood. The fluid is then of a very dark-brown color, sometimes black, and no clots are present, the sac collapsing completely after removal of its contents. A case which well illustrates this is the following:

Case 1. A man of 77 had a hydrocele of 20 years' duration, which I had tapped at intervals of four to six months for 10 years. As he had moved into a distant place in the country I did not see him for 18 months and the sac had filled to a large size. When it was tapped, instead of the normal yellow of the hydrocele fluid, there was present a thin fluid of a black color, which was easily recognized as caused by the presence of blood. Upon questioning him as to any injury he had received in that region he recalled that 14 months before he had been riding in his farm wagon over a rough field when it ran over a stump. He was thrown up and fell back with great violence upon a hard wooden seat. A great deal of pain at once resulted and the tissues of the scrotum were extensively ecchymosed and swollen. This was gradually absorbed and the circumstance had passed from his mind.

This case was interesting not only from the slight effect such a severe blow had upon the course of the hydrocele but also because it shows how little power of absorption is present in the endothelial lining of the tunica vaginalis.

The black color of the fluid showed that it had been present for a long time and thus corresponded to the history given by the patient. A further interesting fact was that no clots were present as the sac was completely emptied through a small cannula. Many similar cases have been seen by the writer, but in no case was there so long an interval between an injury and the tapping of a sac containing unabsorbed blood. Another and very common cause of these secondary hematoceles is an injury to the walls of the tunica vaginalis by a trocar used in tapping a hydrocele. A leakage takes place into the cavity and the sac refils until in forty-eight hours it may be as large as before tapping. As a rule, a moderate ecchymosis occurs in the skin and fulness and pain are complained of. If a large amount of blood has been rapidly poured into the sac, clotting occurs and the fibrin is gradually separated from the clot and attaches itself to the walls, which become thickened and firm. Thus we have developed a chronic hematocele which is firm, non-elastic and not translucent to light, resembling a solid growth. As the hydrocele fluid re-forms, a tumor results, partly fluid and partly solid, and after tapping the hydrocele the fluid escapes, leaving behind the solid masses of organized blood clots. Such cases require operative relief.

Another result which is more favorable but less common is the cure of a hydrocele by the development of an hematocele within its cavity. A careful search of the literature of the subject has failed to find cases reported where this has occurred, yet that it does happen may be seen by the following cases:

Case 2. A man of 40 consulted the writer 15 years ago for the treatment of a small hydrocele which was secondary to tuberculosis of the testis and epididymis. Removal of the testis on the opposite side had been done five years before for tubercular disease. As the size of the sac caused him some inconvenience it was tapped, but in four or five months refilled, when it was again tapped. On his third visit, six months later, he was similarly treated but with quite different results. Within a few hours the scrotum rapidly swelled, the skin became ecchymotic and the cavity of the tunica vaginalis was filled to extreme distention. Rest in bed with ice bags soon caused an amelioration of the symptoms, the swelling slowly disappeared and the hydrocele did not return as usual nor has it since, for this patient has reported for examination within a month.

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* Read at a meeting of the Staff of Mt. Sinai Hospital, Oct. 23, 1915.

CASE 3. A man of 32 had a hydrocele which had been tapped twice a year for seven years, and for the last three years by the writer. After each tapping the sac was thoroughly emptied and no symptoms were noted. At the last operation the fluid was removed as usual but within a few hours the sac began to refil, the skin was ecchymosed and at the end of 48 hours it was as large as before. Palliative treatment was used, ice bags and rest in bed for a day, and later support of the scrotum by a large jockey strap. The swelling slowly decreased and the hydrocele has not returned.

Another similar case will be cited later which illustrates this as well as another fact in the etiology of the disease.

Two other similar cases have been observed. The probable explanation is that the blood clot acts as a foreign body and produces an irritation of the walls of the sac which obliterates it. We thus produce by accident the same result as we do when we insert catgut into the hydrocele or inject into it carbolic acid or tincture of iodine.

Another cause for this disease is the capillary oozing from the walls of an over-distended sac after tapping, just as it happens in the bladders of old men when too large an amount of residual urine is removed by catheterization.

I desire to add to the etiology of this disease one more cause which has not been mentioned before by any one, unless it has been overlooked in my search of the literature of this subject, and that is syphilis.

Every physician is familiar with the results of the arterial changes which take place from this disease elsewhere in the body, for example, hemiplegia, paraplegia, aneurysm and the like. There can be no doubt that a similar condition of arterial degeneration exists at times in the arterial coats of the blood vessels of the tunica vaginalis which permits minute ruptures and the slow or rapid effusion of blood into a hydrocele sac.

Very clearly is this shown by the following case:

CASE 4. J. B., 51 years of age, had syphilis 20 years prior to the present happening. For some years he had a hydrocele which had been tapped several times, the last two or three times being by myself. Considering that it needed tapping and feeling a little uncomfortable, he came in one day and I examined it and found that it was moderately distended, and prepared to tap it as usual but he remembered that he had some important business to attend to and decided to wait. Three days later he returned and a great change had occurred, for in place of an elastic tumor he had one of stony hardness, resembling in all particulars a solid growth, and had it been the first time I had examined it I should have so diagnosed it. The fluid was easily removed through a cannula and showed a mixture of blood and hydrocele fluid. There was some reaction and the sac refilled rapidly but this absorbed and the hydrocele has never returned, showing the possibility of a cure by the development of this complication.

In this case there was absolutely no history of a blow or injury of any kind. Four other cases, which space does not permit me to relate, have suggested equally strongly the etiologic importance of syphilis. It must be remembered that not alone in hydrocele sacs may blood be found but also in spermatoceles, which are usually not in the tunica vaginalis at all but outside of it, being developed from embryonic organs, the paradidymis or organ of Giraldes and the hydatid of Morgagni. A blow upon this collection of fluid or a trocar wound may cause an hematocele.

CASE 5. A patient with a very large spermatocele was referred to me by Dr. Chenery, and upon tapping showed only the characteristic milky fluid. A second tapping six months later resulted in rapid refilling, so rapid that in 24 hours it was two-thirds of its original size and the scrotal tissues were swollen and ecchymosed. This subsided gradually and the case has not been seen since.

Among the rare causes for both primary and secondary hematoceles are hemophilia and scurvy.

The occurrence of the primary form of an hematocele is not common because a blow upon the scrotum is much more apt to cause an effusion of blood into the scrotal tissues forming a hematoma, than to produce a collection of blood in the relatively small space normally present between the walls of the tunica vaginalis. The following case shows very clearly, however, that it may happen, that it may reach an enormous size and that, by the pressure upon the tissues covering it, it may cause great danger to life when neglected.

CASE 6. A man, 51 years of age, married, by occupation a baker, consulted me on Nov. 22, 1912, regarding a large tumor on the right side of the scrotum. Two months before his visit he had fallen from his wagon, across one of the shafts, striking the right side of the scrotum with great force. Immediate swelling and pain resulted and after the acute symptoms subsided there was a gradual increase in size. At the time of his visit a tumor as large as an adult head apparently occupied the whole of the scrotum. The penis could not be seen, but on the left of the swelling was an opening where the skin was apparently folded in and at the bottom of this the glans penis could be felt. The tumor was tense, moderately fluctuant and not translucent, and there was no pain on pressure or impulse on coughing. This condition is well shown in the accompanying illustration, taken after it had again refilled.

The sac was punctured by a trocar which was followed by the escape of a fairly thick fluid containing a large amount of blood of rather bright color. It came slowly through the cannula and it required an hour to empty the sac partly. More than three quarts (105 ounces) of fluid were removed and a large soft mass of blood clots still remained in the sac. Many small clots were present in the fluid withdrawn. Immediate operation was advised and accepted, but for business reasons it was put off from time to time until Jan. 7, 1913. Meantime the sac refilled until at the time of operation it was larger than at the first visit. Due to the tension upon the walls of the sac and the scrotal tissues a slough, the size of a hand, formed at the lowest portion of the swelling, from beneath which a thin, bloody discharge oozed. A slight elevation of temperature (100 F.) appeared and sepsis was evidently imminent and his color and appearance was that of a sick man. Because of his obesity (nearly 300 pounds), his poor color and bad heart action, he was a poor ether subject, and spinal anesthesia was decided upon and applied. The operation was performed by Dr. Arthur P. Janes, Dr. E. W. Cushing, consultant.

An incision was made high up in the groin and continued over the sac around and including the slough. The cord was first dissected and the tumor mass below was gradually loosened from its attachments and removed without entering its cavity. A considerable portion of the redundant skin and subcutaneous tissue was also removed. The incision was partly closed by sutures, leaving a large space below for drainage. Primary union was not expected nor obtained and the convalescence was slow but ended in complete recovery.

The pathologic examination of the mass removed was made by Dr. Timothy Leary at the Tufts College Medical School and was as follows:

Specimen consists of tunica vaginalis distended to form an enormous thick-walled sac, 23 x 13 x 10 cm. Along one surface of the sac can be traced the spermatic cord. Lying at end of cord and but slightly elevated above surface is a rounded mass 3.5 cm. in diameter. Section here shows what appears to be testicular tissue extending to a depth of 2 cm. Vessels of surface are dilated and injected.

On laying open, wall of sac is seen to vary in thickness from 4 mm. at base to 1.5 cm. at top. Sac is filled with clot and a clear jelly-like material. Along inner edge of wall can be seen delicate gray-white strands of tissue running into clot.

The skin received with specimen measures 17 x 8 cm., is thick, coarse, hypertrophied. In the subcutaneous tissue are seen three rounded masses, one at either end of skin and one in center measuring (a) 5.5 cm., (b) 4.5 cm., and (c) 2.5 cm. in diameter. On section, *a* and *c* consists of rather soft, red-brown tissue, *b* consists of a thick-walled sac filled with edematous gray-white tissue.

Mx. shows in wall a marked increase in fibrous connective tissue with a heavy infiltration with lymphoid cells. In places occur masses of old clot undergoing organization. The wall shows occasional small abscesses. The contents of sac consists of clot with masses of pus in places undergoing organization. Mx. through skin nodules show merely a chronic inflammatory picture.

Diagnosis.—Chronic and acute inflammatory.

The unusual features of this case are the rapid formation of an hematocele containing more than three quarts of fluid, the rapid refilling of the sac, and the great danger from septic infection from the patient's neglect to have the operation done promptly.

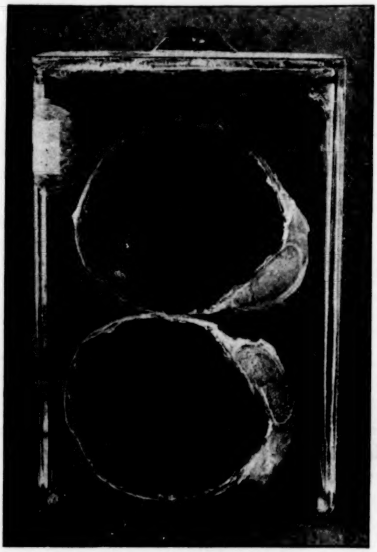
The important point to the clinician in the pathology of this disease is the effect upon the testis when a large amount of blood rapidly escapes into the cavity of the tunica vaginalis and fills it with clots. The fibrin is separated and adheres to the walls in layers and the cavity itself is filled with a gelatinous material. The walls become thickened and from this and the internal pressure atrophy of the testis occurs, which indicates the necessity of early operative measures in cases of this type. The diagnosis is usually easily made in acute cases by the history of an injury, the ecchymosis of the scrotum if present, and by aspiration of the sac, which shows a blood-stained fluid.

Much greater difficulty in diagnosis is present in chronic cases or in the acute forms where the blood clots fill the sac.

We then have a firm, non-elastic swelling which does not transmit light, is not tender to pressure, and aspiration does not show the presence of fluid because the clotted blood will not escape through the needle. The diagnosis lies between benign or malignant growths, syphilitic orchitis, tuberculosis and certain forms of hernia, as well as hydrocele and extra-vaginal cysts.

The treatment of hematocele depends upon the amount of blood present and whether it is a primary or secondary form.

In the small collections of blood which form in the cavity of the tunica vaginalis, rest and cold applications should be sufficient to cause absorption of the blood contents. Where a little blood is mixed with the contents of a hydrocele or spermatocele no treatment is required as it is usually not recognized until the fluid is later removed. But in those cases where the quantity of blood is large enough to clot quickly and fill the cavity into which it escapes with a solid mass of clots, an early operation is necessary. The condition present in such cases is very well shown in the photograph of a specimen of hematocele from the Pathologic Museum of Tufts College Medical School. The cavity of the tunica vaginalis is filled to extreme distention with clots and in the walls may be seen white masses of cholesterine crystals.



An incision and removal of the clotted blood is usually enough for these primary cases but in those secondary to hydrocele the sac should be removed as in the ordinary operation for this disease. In very old cases with thick walls and involvement of the testis a castration may be indicated but should be avoided when possible.

In operating upon cases of apparently malignant disease of the testis the possibility of this condition being present should be kept in mind, and a small incision made into the growth may aid the diagnosis and treatment.

A STATISTICAL STUDY OF THE MORTALITY FROM DIABETES MELLITUS IN BOSTON FROM 1895 TO 1913, WITH SPECIAL REFERENCE TO ITS OCCURRENCE AMONG JEWS.

BY H. MORRISON, M.D., BOSTON.

THE testimony of observers, both in America and in Europe, goes to show that diabetes mellitus occurs more frequently among Jews than among their neighbors. With a view of getting data on this matter at first hand, I undertook a statistical study of the mortality of this disease from the death returns as recorded at the office of the City Registrar of Boston. This investigation covers a period of nineteen years,—1895 to 1913,—during which there were reported 1775 deaths due to diabetes mellitus. Of these, 127 were among Jews out of a total of 6936 deaths from all causes, and 1648 were among non-Jews out of a total of 222,532 deaths.

These figures show that the ratio of the number of deaths due to this disease to the total number of deaths from all causes is 0.018 among Jews and 0.007 among non-Jews. From further analysis I get this ratio to be 0.014 for those of German parentage, 0.013 for those of English parentage, 0.012 for those of American parentage, and 0.009 for those of Irish or Canadian parentage. In Boston, therefore, diabetes mellitus has been twice as frequent a cause of death among those of German, English or American descent as among their neighbors, and two and a half times as frequent among Jews.

SIMILAR INVESTIGATIONS IN OTHER CITIES.

In a similar study in Frankfurt-a.-M., Wallach[1] found that during the years 1872 to 1890 there had been 171 deaths from diabetes in that city; the proportion of deaths from this disease to the deaths from all causes was six times as great among Jews as among the other inhabitants. Auerbach[2] in an analysis of the demography of the Jews in Budapest, Hungary, found that of the 487 deaths reported as due to diabetes during 1902-7, 238, or more than half, occurred among Jews, though they constituted only 23.6% of the population; the rates were 5.9 deaths due to diabetes per 100,000 Catholics and 21.4 per 100,000 Jews. Naunyn, Frerich, von Noorden and other specialists in diseases of metabolism also found that Jews supplied an extremely large quota of their patients, suffering from diabetes,—Frerich[3] 25%, and von Noorden[4] as high as 38.8%.

In New York City Stern[5] found the mortality from this disease among Jews in 1899 relatively more than double that among the non-Jews. Rudisch and Aronson[6] have investigated the morbidity of this disease in the New York Mt. Sinai Hospital and compared it with that in four non-Jewish Hospitals in that city; they came to the

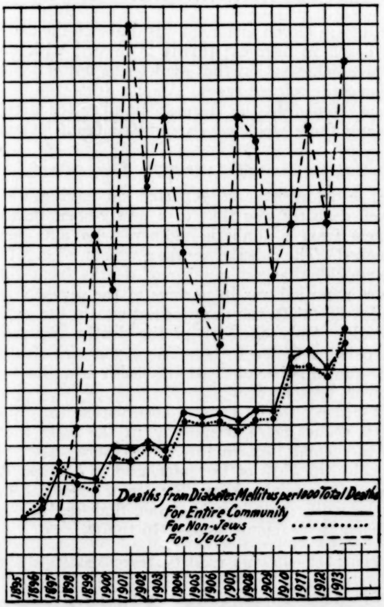
Table I.

	Population of Boston.	Estimated Jewish Population.	No. of Deaths from Diabetes.			Total No. of Deaths in Boston.	Total No. of Deaths Among Jews.	Deaths from Diabetes per 1000 Total Deaths.			Deaths from Diabetes Mellitus in Boston per 100,000 Population.
			Among Non-Jews.	Among Jews.	Total.			Among Non-Jews.	Among Jews.	For the Entire Community.	
1895—.	499,017	19,500	35	0	35	11,337	217	3.1	0	3.1	7.1
1896...	511,602	21,000	44	0	44	11,650	258	3.9	0	3.76	8.6
1897...	524,187	22,500	63	1	64	11,170	319	5.8	3.1	5.73	12.2
1898...	536,772	24,000	54	2	56	10,903	252	5.07	7.9	5.14	10.4
1899...	549,357	27,000	53	5	58	11,178	270	4.86	18.5	5.2	10.5
1900...	561,477	27,100	72	5	77	11,671	319	6.35	15.67	6.9	13.7
1901...	568,763	27,200	69	8	77	11,306	268	6.25	30.	6.81	13.7
1902...	576,049	29,700	74	6	80	11,002	282	6.9	21.2	7.27	13.9
1903...	583,335	30,100	69	7	76	11,222	279	6.3	25.1	6.77	13.0
1904...	590,621	31,300	95	5	100	11,383	284	8.55	17.6	8.79	16.95
1905...	597,908	37,200	93	5	98	11,488	343	8.3	14.57	8.53	16.4
1906...	613,075	43,300	97	5	102	11,962	402	8.34	12.4	8.61	16.6
1907...	628,242	47,000	93	11	104	12,313	438	7.83	25.1	8.44	16.6
1908...	643,409	55,500	100	12	112	12,457	506	8.36	23.7	8.9	17.4
1909...	658,576	58,600	97	8	105	11,805	492	8.57	16.26	8.89	15.95
1910...	673,745	59,000	135	9	144	12,282	472	11.43	19.07	11.72	21.4
1911...	688,912	61,500	137	13	150	12,478	529	11.48	24.57	12.1	21.8
1912...	720,031	64,000	127	9	136	12,311	472	10.72	19.07	11.04	18.9
1913...	735,399	66,000	142	15	157	12,563	534	13.3	28.09	12.5	21.3

conclusion that after making all allowances for the chances of error, diabetes mellitus is nearly three times as prevalent among Jews as among their neighbors.

THE MORTALITY FROM DIABETES MELLITUS IS STEADILY INCREASING.

There has been a general increase in the mortality of this disease both in this country and in Europe. According to the United States census the death rate from diabetes mellitus was 0.9 per 100,000 population in 1850; 1.1 in 1860; 2.1 in 1870; 2.8 in 1880; 5.5 in 1890; 9.3 in 1900; 14.9 in 1910. In Boston the death rate of this disease was 7.1 per 100,000 inhabitants in 1895; it rose steadily to 21.3 in 1913. In New York City it rose from 2.9 per 1000 total deaths in 1889 to 10 in 1910. In the same terms for Boston, it rose from 3.1 in 1895 to 13.3 in 1913. It is incorrect, however, to assume that this increase is accounted for by the increase in the Jewish population of these cities, as is done by Wilson[7] in the *Medical Record* of 1912, p. 662. He there traces two curves, one showing the increase in the death rate of diabetes in New York City as mentioned above, the other showing the increase in the Jewish population in that city. Because these two tracings are parallel in their upward direction this writer takes it for granted that the increased death rate from diabetes in New York is due to the increase in the Jewish population. The increased tendency to diabetes, however, has been general throughout all civilized communities, even where Jews do not form an appreciable element in the population. Certainly in Boston the increase of the Jewish population has not been the cause of the increased death rate from diabetes. An analysis of the death rate from diabetes per 1000 total deaths during the period under consideration, as indicated by the following curves, shows that it has not been appreciably affected by the death rate from diabetes among Jews, though this has been certainly relatively high.



NATIVITY.

The largest number of deaths from diabetes in Boston during the period investigated occurred among those of Irish parentage—656 out of a total of 1775—more than one-third. This, however, is not out of proportion, for the Irish are the predominant element in the population of Boston. The ratio of their number of deaths from diabetes to their total number of deaths is 0.009, while that for the entire community is 0.007. The following table gives the nativity or nativity of the parents of those who had died from diabetes during the period investigated:

Table II.

	Non-Jews.	Jews.
Ireland	656	
United States	642	8
Canada	132	
England and Scotland	78	2
Germany and Austria-Hungary	75	30
Italy	21	
Sweden and Norway	16	
France	8	2
Russia and Poland	5	85
Azores	4	
Holland	2	
Switzerland	1	
Spain	1	
Portugal	1	
Finland	1	
Turkey	1	
China	1	
Syria	1	
West Indies	1	
Philippines	1	

Only in eleven instances was diabetes the cause of death in negroes; this is in accord with the general observation that diabetes is not common among the colored races. Among Jews who died from diabetes, the largest number occurred among those who had immigrated from Russia.

AGE AND SEX.

The youngest case reported as having died from diabetes was that of a newly-born infant taken from a diabetic mother, who also succumbed. The oldest case was a woman of eighty-seven. The largest number of deaths from diabetes recorded was in persons of the seventh decade—60 to 70; the next largest was in the sixth decade. Only one-fifth of the deaths occurred in persons under forty. There was practically an equal number of deaths in children under ten and in persons over eighty.

Contrary to the general observation that diabetes occurs more frequently in the male than in the female sex, in this series there were 958 females, or 55% of the total, and 817 males, or 45% of the total. Above the age of twenty, also, there were more deaths from diabetes among women than among men,—916 to 760.

Table III.—Deaths from Diabetes Mellitus by Age and Sex.

	Under 10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	Total
Males	16	41	64	82	102	176	226	102	8	817
Females	17	25	46	62	124	227	299	132	26	958
Total	33	66	110	144	226	403	525	234	34	

DURATION OF THE DISEASE.

An analysis of the death returns investigated does not give one anywhere near a true estimate as to the probable duration of diabetes. Of the 1775 returns 567 do not give the duration at all, while 267 have the indefinite terms "years" and "months". Only a little more than half, 951, have the duration of the disease in definite terms. These show that the largest number of deaths from diabetes occurred in persons who had apparently had the disease one year or less. The longest duration recorded was in the case of one man, who had had it for thirty years.

Table IV.—Duration of Diabetes Mellitus as Recorded in 1775 Death Returns Studied.

Not given	567
"Years"	207
"Months"	50
1 year or less	309
2 years	207
3 "	102
4 "	56
5 "	71
6 "	26
7 "	24
8 "	30
9 "	8
10 "	59
11 "	4
12 "	8
13 "	4
14 "	3
15 "	17
16 "	4
18 "	3
19 "	1
20 "	6
27 "	1
30 "	1

COMPLICATIONS.

The following analysis shows the frequency of some of the conditions associated with or complicating diabetes mellitus in the causation of death. Coma occurred in 362 cases; gangrene in 178; pneumonia and bronchitis in 101; tuberculosis in 80; acute infections, as influenza and erysipelas in 68; carbuncle and furunculosis in 36. Cardiac complications are mentioned in 126 cases; renal in 88; hepatic in 4; arterio-sclerosis, including apoplexy, in 94 cases. Neoplasm is spoken of in 22 cases; syphilis in 2; pregnancy in 3; acromegaly and exophthalmic goitre in one each. The pancreas is mentioned in 3 cases.

OCCUPATION AS AN ETIOLOGICAL FACTOR.

Several observers point out the frequency of diabetes among professional men. In this series of 1775 deaths from the disease 1135 occurred in children, women, and men retired from active life. Of the other 640 deaths 233 were among men in mercantile pursuits, 326 among artizans, and 81 among professional men.

IS THERE ANY RELATION BETWEEN THE MORTALITY FROM DIABETES AND THE SEASONS?

More of the deaths from diabetes occurred in the six months of cold weather than in the other months. Of the 1775 deaths studied, 1008 took place in the months of January, February, March, April, November and December, as against 767 during May, June, July, August, September and October. I believe there is no significance in this difference beyond the fact that death rate is generally higher in the winter months.

SUMMARY AND CONCLUSIONS.

1. During the period of 1895 to 1913 there were in Boston 1775 deaths from diabetes mellitus out of a total of 229,468 deaths.

2. In Boston, as elsewhere, there has been a steady rise in the death rate from this disease; it was 7.1 per 100,000 inhabitants in 1895 and 21.3 in 1913, or 3.1 per 1000 total deaths in 1895, and 13.3 in 1913.

3. The death rate from diabetes has been relatively very high among the Jews of Boston. The ratio of the number of deaths due to this disease to the total number of deaths from all causes during the period investigated was 0.018 among Jews and 0.007 among non-Jews; so that death from diabetes mellitus occurred about two and a half times as frequently among Jews as among their neighbors. A similar analysis, however, shows that the death rate from diabetes was also very high among those of German, English, and American parentage, 0.014, 0.013, and 0.012 respectively, so that death from this disease occurred about two times as frequently among them as through the community in general.

4. The largest number of deaths from diabetes occurred among those of Irish parentage, 656 out of 1775, or more than one-third of the total. This death rate, however, was not out of proportion to their population. There were only eleven deaths from diabetes among negroes in Boston from 1895 to 1913.

5. This series of 1775 deaths from diabetes is made up of 958 females as against 817 males. This is contrary to the general observation that diabetes occurs more frequently in the male sex. The largest number of deaths occurred in persons of the seventh decade.

6. The duration of this disease cannot be estimated from this study, for nearly half the death returns either did not answer at all this question or gave it in the indefinite terms of "years" and "months". This is a point to be borne in mind in making out death certificates.

7. *Why is the death rate from diabetes mellitus rising?* Better and more thorough diagnostic methods may be a factor, but only a minor one. Diabetes mellitus keeps pace with the increasing complexity of civilization. It is more commonly found in large cities among individuals and races who are constantly under physical and nervous tension. As Kleen[8] puts it: "With greater intellectual exertion, keener emotions, higher nervous development, more earnest struggle for existence, more urgent demands, a more intense culture we are bound to find more diabetes mellitus." It is particularly prevalent among Jews, not because of ethnic peculiarities, but because a severe environment during many centuries has developed a nervous type easily thrown out of balance.

I wish to take this opportunity to thank Mr. E. W. McGlenen, Registrar of Boston, for his courtesy in allowing me to carry on this investigation in his department.

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THE TREATMENT OF CHRONIC DISEASE IS A PROBLEM OF APPLIED PHYSIOLOGY.*

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Pathological-anatomical-bacteriological investigations have contributed much to advance the treatment of acute infectious disease in the last half century, but they have done little to advance the treatment of chronic disease. Though the death rate has decreased by one-half in the last century, and the expectation of life has increased by a dozen years, the improvement is due to progress in the control of acute disease; while the death rate in the registration area of the United States has decreased steadily in the last generation—19.8 in 1880, 19.6 in 1890, 17.8 in 1900, 15.0 in 1910, 13.6 in 1914—the mean death rate for persons over forty years of age, those chiefly affected by chronic disease, has actually increased—3% between 1900 and 1910, and 21.2% between the years 1880 and 1910. Pathological-anatomical investigations have, indeed, tended to decrease rather than to increase optimism; no one who has made himself familiar by actual post-mortem examination with the terribly destructive changes found in the organs in many of the chronic diseases can believe that drugs will restore these organs to their normal conditions. This pessimistic attitude toward the possibilities of treatment in chronic disease is due to a wrong point of view concerning the purpose and principles of treatment; to the fact that too much emphasis is laid on the anatomy, and too little on the physiology of disease.

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* Part of an address read before the joint meeting of the Association of American Medical Colleges, and the Federation of State Medical Boards, Chicago, Ill., Feb. 8, 1916.

The more hopeful light in which the possibilities of treatment in chronic disease are seen when we fix the attention on physiology can be brought out by considering the purpose and methods of treatment.

The aim of treatment in acute diseases is complete removal of disease, or diseased material, or the cause of disease. The antitoxin treatment of diphtheria, and the removal of a diseased appendix are among the best examples. But even in the case of acute diseases like scarlet fever and measles, in which such direct radical treatment is not yet available, and in which the disease must be left to run its course, to be combated by the natural defences of the body itself, the result aimed at, in promoting conditions under which the body will act to best advantage, is also complete removal of all evidence of disease.

In chronic disease, though we often use the direct therapeutic methods of acute medicine, the most important part of the treatment usually has a different objective; it has to do, not with structure, but with function. An organ may be the seat of disease and yet, on account of the very great reserve powers of all the organs, functionally efficient. The normal heart, it has been calculated, can do six times the work ordinarily required of it; and the factor of safety of certain double organs, since one of the pair can be removed without danger to the patient, must be at least 100%. But with severe disease there comes a time when the affected organ cannot do the amount of work ordinarily required of it; the physician is then called in, not to make the organ anatomically perfect, but to restore equilibrium between the work required of the organ and the work which it can do; and though the diseased organ may never be made anatomically normal, it may be made functionally efficient, that is, competent to its tasks. When the heart, for example, becomes so badly affected that the amount of work it can do is less than the amount required, when compensation fails, the leaky valve or other anatomical change responsible for the condition cannot be removed or made whole. But the patient does not demand this; he wants the symptoms alleviated so that he will be more comfortable and better able to do his work; it is not *anatomical integrity* that the patient demands but *functional efficiency.*

Not only in chronic disease, but also in those specific infectious diseases in which direct treatment is not yet available,* the treatment is directed toward improvement in the function of the various organs. The basis of the trouble in chronic disease is usually a disorder of some special organ or function—the heart, the kidney, the sugar metabolism, for example—and treatment is centered around improvement in the efficiency of this organ or function; the same methods of treatment are applied in most of the acute infectious diseases, but they are not centered on improvement in the efficiency of any one organ or function.

Functional efficiency may be improved, equilibrium—though perhaps on a lower plane than the normal—between work required and working power may be brought about by two groups of methods: (1) methods which decrease the demands upon organs, (2) methods which stimulate organs to do better work; and therapeutics deals largely with questions of when and how to apply such methods. *Therapeutics is, therefore, in great part, a branch of applied physiology.*

Question may arise as to the correctness of the physiological point of view outlined here. It cannot be denied that the facts upon which the anatomical view of disease are based are as correct as the physiological facts; but facts alone, though they are the elements from which the truth is formed, do not make the truth; the truth has many aspects, and the important thing in determining the best aspect of a truth lies not alone in the correctness of the facts, but in the pragmatic value—in the Kantian sense—that the point of view which results from the selection of the facts and the distribution of emphasis among the facts has as a useful productive agent.* With this criterion of usefulness as a guide, let us contrast, from the standpoint of therapeutics, the hopeful physiological aspect of disease with the anatomical aspect.

I have already referred to the pessimistic attitude toward the possibilities of treatment in chronic disease resulting from the pathological-anatomical viewpoint; even eminent practitioners, because of the difficulty of believing that treatment can influence the structural changes which the anatomical view brings into prominence, often show a tendency to consider the so-called chronic and incurable diseases as hopeless conditions having an inherent downward tendency. But most chronic diseases do not have a downward tendency; they result in a weakness of function, and if the functional activity of the patient is adapted to his functional capacity the *status quo* may not only be maintained, but often improved. It is a mistake to associate together the words "chronic" and "incurable." The dictionaries (Century, Webster) define "incurable" as "beyond the power and skill of medicine," and give "hopeless"—a term which implies that the physician is powerless—as a synonym. Though the term "incurable" may, possibly, be properly applied to those acute infectious diseases not susceptible of specific treatment, whose course it is "beyond the power and skill of medicine" to influence directly, it should not be used with reference to such conditions as heart disease, Bright's disease, diabetes, and many other chronic diseases; we may, indeed, be unable to influence the anatomical changes found in these diseases, the anatomical changes may be incurable; but looked at from the standpoint of physiology, the disease is not "incurable"; the course of the disease, the functional efficiency of the patient, is amenable to, often indeed, largely determined by treatment. A patient whose leg had been amputated would not be sent away with the statement that, since it is impossible for him to grow a new leg, nothing can be done for him; by the use of an artificial leg, and by refraining from certain activities, such a patient can become nearly as efficient as a normal man; the same attitude should be taken toward patients with incurable lesions of internal organs; these patients, too, can often be made functionally efficient.

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* Preventive treatment belongs largely outside the field of what is generally understood as therapeutics. Direct treatment—diphtheria antitoxin, appendectomy, quinine, salvarsan, etc.—is but yet a limited field.

* Compare Goethe's dictum, "Was fruchtbar ist, allein ist wahr."

All this bears directly on the question of the correctness of the physiological point of view. Surely this optimistic point of view is a more useful guide, has greater pragmatic value in therapeutics than the pessimistic anatomical point of view. *If usefulness, pragmatic value, are measures of the correctness of a scientific truth, the anatomical point of view is a wrong one from the standpoint of therapeutics and the physiological point of view is the correct one.*

ACUTE ARTHRITIS EXPERIMENTALLY PRODUCED BY INTRAVENOUS INJECTION OF THE STAPHYLOCOCCUS PYOGENES.*

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In a previous paper,† I pointed out that the staphylococcus organism of shifting grades of virulence localized on intravenous inoculation in different structures of the body, and that within certain limits a selective localization of this micro-organism for special organs could be developed by cultivation of the organism in functionating tissue. I also showed that when the staphylococcus attained an affinity for a certain structure of the body, a fresh subculture of the organism obtained from a focus of infection was apt to possess properties leading to its localization in that tissue.

The following remarks have reference to the production of arthritis by intravenous injection of a staphylococcus. The strain used was the one employed in the gastric ulcer series. It was obtained by blood culture from a case of septicaemia in man. At first, following intravenous injection of the organism into the general circulation of rabbits, the joints of the animals showed no gross pathological change except a very occasional slight hyperaemia of the periarticular tissues. However, cultures of the apparently negative joints very often yielded a pure growth of the staphylococcus. As negative joints in the early rabbits experimented upon appeared so regularly, examination for arthritis was gradually discontinued; but when rabbit No. 47, following upon an intravenous injection of a ten-day-old agar culture of the staphylococcus isolated from a stomach wall focus of rabbit No. 45, showed distinct lameness in the left hind leg, and at autopsy revealed an acute arthritis, routine examination for joint lesions was resumed.

The material used for injection was prepared by suspending an agar slant culture in about 10 c.c. of normal saline. The usual dose of such an emulsion was 1 c.c. for a rabbit and 3 c.c. for a dog.

In this series all but one animal (a dog) were rabbits. The following are a number of typical protocols of the animals injected after the staphylococcus had attained a sufficient virulence to cause acute arthritis.

Rabbit No. 47, wt. 900 grams, was injected intravenously with one cubic centimetre of saline emulsion made from a ten-day-old agar culture obtained from a stomach wall focus in rabbit No. 45. About 24 hours later, the animal showed lameness especially in the left hind leg, but otherwise seemed quite well. It was etherized and autopsied 36 hours after inoculation. The elbow joints show slight hyperaemia, joint fluid clear and apparently not increased in amount. Both knees are swollen and red. The redness in the right leg is limited to the joint, but in the left leg, it extends down to, and includes the ankle. Incision into the knee joints liberates a thick sanguinous fluid. The stomach, appendix and other organs are negative. Cultures from the joints on agar and in ascitic dextrose broth show a pure growth of the staphylococcus. Cultures of the heart's blood are negative.

Rabbit No. 48, wt. 1025 grams, was injected intravenously with 1 c.c. of the same emulsion used in rabbit No. 47. The next day the animal appeared lame, but otherwise seemed normal. On the second day after injection it was etherized and autopsied. The knees and elbow joints are red and swollen. The joint fluid is increased in amount, that of the elbow cloudy and of the knee purulent. Fresh smears of the fluid show leucocytes, red blood corpuscles and staphylococcus in pure culture. The appendix is very slightly injected and shows two small white areas, which from previous experience, are recognized as foci of the staphylococcus. There is one small abscess in the muscles of the abdominal wall. The kidneys appear slightly congested, otherwise normal. The heart and stomach are negative. Cultures on agar and ascites dextrose broth yield a pure growth of the staphylococcus.

Rabbit No. 56, wt. 975 grams, was injected intravenously with 1 c.c. of an emulsion of a 20-hour-old agar growth obtained by culturing knee joint of rabbit No. 47. About 72 hours later, the animal appeared very sick, and therefore, etherized

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† Experimental Production of Gastric Ulcer, Boston Medical and Surgical Journal, May 11, 1916.

and autopsied. The knees are very much swollen and red. The joint fluid is increased in amount and semi-purulent. The other joints appear normal. The appendix is acutely inflamed. The distal half is turgid, diffusely hyperaemic and rigid. The proximal half shows little change from normal. The heart shows myocarditis. The kidneys, stomach, gall-bladder and skeletal muscles are negative. Cultures of the knee, heart's blood and appendix yield a pure staphylococcus growth.

Rabbit No. 57, half-grown, injected with 1 c.c. of emulsion of the strain used in No. 56. On the fourth day after inoculation, the animal appeared to be very sick. It died the same day and autopsy was made shortly after death. The knee joints are acutely inflamed. The joint fluid is increased in amount and cloudy. The elbows are injected but not appreciably swollen. The gall-bladder is distended and measures two by one-half inches. Its wall is oedematous and studded internally with small white nodules, that under the microscope, turn out to be colonies of staphylococci. The fluid contents of the gall-bladder is muco-sanguinous and tinged a pale olive green. A fine yellow sediment is found in the dependent portion of the bladder. Fresh smears of the fluid show staphylococci. Stomach, heart and appendix are negative. The kidneys are finely granular and yield a pure culture of staphylococci. Cultures of gall-bladder are also pure growths of staphylococci.

Rabbit No. 63, wt. 1025 grams, injected intravenously with 1 c.c. of an emulsion of a 24-hour old agar slant culture of knee of rabbit No. 57. Animal died about 72 hours later. Left elbow is hemorrhagic. Joint fluid is increased and turbid. Other joints are apparently negative. In the muscles of the legs and abdominal wall are numerous small abscesses. Heart shows myocarditis and endocarditis. Kidneys show a few very small abscesses. Cultures of all the joints, heart and kidneys are positive for staphylococci.

Dog, female, wt. 11 kilos., was injected into femoral vein with 3 c.c. of an emulsion of a 24-hour-old agar culture from knee of rabbit No. 56. The next day the animal seemed normal and ate about three pounds of meat. On the second day, after the injection, she began to look sick and moved about with little energy. On the third and fourth days, she would not eat and lay stretched out in her kennel. Her abdomen was tender, rigid and spastic on touch. The floor of the kennel was partly covered with recently coagulated blood. The animal was etherized and autopsied at the end of the fourth day, wt. 9 kilos. While being etherized, considerable dark unclotted blood was discharged by rectum. Knee joints show slight redness of periarticular tissue and cloudiness of joint fluid. Elbow joints negative. Stomach shows a few hemorrhagic erosions. The duodenum shows about two centimeters from the pyloric ring, a necrotic area measuring 6 x 7 m.m. The centre of it is a bleeding point and apparently the chief source of blood found in the lower bowel. There are numerous small hemorrhagic erosions throughout the duodenum. The ileum, jejunum and large bowel, except for the presence of blood in the latter, are negative. The appendix shows the mucosa to be thickly studded with punctate hemorrhagic elevations. The kidneys are congested, the gall-bladder is negative. Cultures of the duodenal ulcer, duodenal and gastric erosions and appendix, show a mixed growth of the staphylococcus and colon bacilli. Culture of the heart's blood shows a growth of staphylococcus in pure form.

RESULTS.

The results shown by the protocols indicate that the staphylococcus is apt to localize in the joints and to produce typical lesions of arthritis, if the strain is of proper virulence. The organism recovered from the arthritic lesions has a decided tendency to again localize in joints.

In some cases the arthritis was the only lesion found at autopsy, but in other cases it was associated with one or more other lesions, namely, duodenal ulcer, appendicitis, cholecystitis, myocarditis, pericarditis, endocarditis, nephritis, colitis and myositis. These other lesions will form the basis of future reports.

According to these experiments, it seems to be true that while the organism used (a staphylococcus) may show a predilection for a particular region of the body, it will not always produce a gross lesion at the expected point of attack. In order to produce a gross lesion, it is necessary either for the staphylococcus to be of a certain grade of virulence, or for the tissue in which it has lodged to be suitably altered for the growth and action of the organism. This principle demonstrated itself repeatedly in the course of experimental production of gastric ulcer, and again in experimental production of acute arthritis.

REMARKS.

The results of localization obtained in connection with studies of staphylococci are singularly suggestive of Rosenow's† results with streptococci. A comparison of the total results in the two series will be made at a future time when the data are more complete. In the meantime, it seems worth the saying that if these facts apply in the cases of streptococci and staphylococci, it would seem to be possible that they may apply to still other organisms, for so far as we can determine, the essential factor governing localization, is growth in the tissue. After an organism has grown in a certain environment, it tends in later generation to select that environment, or at least, to thrive best in that environment

CONCLUSIONS.

It has been pointed out in a previous communication that the staphylococcus may be caused very regularly to localize in the stomach after intravenous inoculation.

It appears that the same organism may be caused to localize in joints and produce typical arthritis.

I wish to express my thanks to Drs. Paul G. Woolley and William B. Wherry for their interest and valuable assistance in connection with these studies.

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† E. C. Rosenow: Elective Localization of Streptococci, *The Jour. A. M. A.*, Nov. 13, 1915, p. 1688.

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126 Massachusetts Ave., Corner Boylston St., Boston, Massachusetts.

THE DIAGNOSTIC SIGNIFICANCE OF THE WASSERMANN REACTION.

THE Wassermann reaction for the diagnosis of syphilitic states has now been sufficiently long in use to justify for itself a definite place in the armamentarium of the profession. To neglect its use in suitable cases is to deprive one's self of the most important method in the determination of the presence or, so to say, the past presence of some form of manifestation of syphilis. The importance of being in position to say with some degree of certainty, either in the differentiation from many chronic eruptions or growths of doubtful origin, in congenital cases, with respect to the permissibility of marriage in persons exposed, in many of the parasyphilitic states, as well as in the numerous phases of jurisprudence relating thereto, that syphilis is the causative factor, is obvious. Many of these pathologically obscure conditions may, of course, coexist. With due regard, however, to the important diagnostic value of the Wassermann reaction, its significance must not be overestimated. The reactions, whether positive or negative, must not be taken as absolute in determining the presence or in excluding the existence of syphilitic states.

In general, it can be said of this reaction, as of other serological or allied reactions, that positive results are merely evidentiary, and that negative results do not bar out the presence of conditions sought to be determined by the reactions. A number of conditions, particularly of tropical origin, give positive Wassermann reactions, and hence, where there has been a possibility of exposure to such diseases, they must be excluded before even very positive reactions are resolved in favor of syphilis. On the other hand, in syphilitic reactions, as perhaps nowhere else, the reaction can be innocently, but especially deliberately, masked by a patient in whose interest it may be to hide the presence of the disease. Alcohol, even when not enough is taken to intoxicate, mercury or antisyphilitic treatment of any kind, will act to mask or make negative an otherwise positive reaction.

Moreover, the technic of the reaction is so delicate that the differences between slightly positive reactions, neutral ones, or slightly negative ones are too little pronounced to serve for diagnosis. The many modifications of this reaction that have been evolved in the interest of ~~greater defin~~iteness of reaction, or greater simplicity of technic, all testify to this difficulty. And besides, the personal equation of the serologist enters very largely into the nature of the interpretation put on a particular reaction, especially when it is borderline in degree. Equally good men may interpret a reaction diametrically opposite. Syphilographers appreciate this. They are wont to submit specimens of the blood of the same patient to a number of serologists, and to accept the majority finding, or, if it is a matter of the degree of the reaction, they average the results obtained. Determinations are not made from doubtfully positive or doubtfully negative reactions. Even a very positive reaction should receive at least one other test, and, if possible, by a different serologist. For most syphilographers a Wassermann reaction has little or no value unless given above the name of a trusted serologist—so much does the value of the reaction depend upon a faultless technic and careful interpretation. A positive Wassermann reaction, at least +4, is diagnostic when found in conjunction with suspicious symptoms of lues, characteristic scars, parasyphilitic manifestations or the like. While in clinical determinations for the purpose of instituting treatment lesser assurances may be taken, in medico-legal cases or in the establishment of the fact of a cure, perhaps for marriage, the complete extent of the Wassermann assurance must be demanded. If the reaction is deliberately masked or there is otherwise a lack of voluntary coöperation between subject and examiner, the reaction becomes accordingly of less value.

The use of the Wassermann reaction on a rather large scale, as among immigrants, has often been suggested. While undoubtedly a great many positive Wassermann reactions would be obtained, they would be relatively few, and even these would be negatived by the fact that the reaction may be an expression of the many conditions to which immigrants coming from so many places may be exposed. The detection of active syphilitic disease could be more easily accomplished by thorough physical examination. Latent, non-active, and therefore non-contagious syphilis is significant because of the likelihood of transmitting the disease to offspring, but the difficulty of technic, the cost, the uncertainty of results, the ease of masking reactions and the medico-legal questions which would arise would hardly justify its universal use, even to forestall the admission of these undesirable luetic strains. The energy used and the expenditures involved, if applied to more thorough mental and physical examinations, would be of far more value in the exclusion of the unfit.

Until serological examinations are rendered more certain in their meaning, the results must be accepted only when obtained by the most competent workers, and with due regard and due allowances for the difficulties, the uncertainties and the personal equations involved.

THE SOMATIC FACTOR IN MENTAL DEFICIENCY.

INVESTIGATIONS into the causes and into the nature of many forms of mental deficiency have brought out the fact that many of them are due not so much to inherent and intrinsic maldevelopment or deficiency of the brain substance, of hereditary origin, but more often to a great many extrinsic factors which operate to close up certain paths of ingress to the brain and to exclude the necessary stimuli from exerting their influence in its development. Often it serves merely to deprive the mind of such orientation as is required of the mentally competent; more often the lack of it actually retards brain development. As soon as such paths can be made patent mental development can go on as in the normal. The mental deficiency exhibited in those having various sensory or motor defects very well exemplifies this etiological factor. The correction of the sense defects, particularly, "cures" many of those apparently defective. But when these sensory or motor paths are permanently closed and the brain is permanently deprived of these sources of stimulation and fertilization, then the mind remains permanently underdeveloped to the extent of the deprivation. When the extent of these closed paths is not too great there may be no appreciable amount of mental deficiency, unless, perchance, some special knowledge or ability, in which some special paths would operate, is required. Moreover, there are a great many senses outside of the five special senses, the unspecial ones, the non-development of which cause deficiencies of a greater or lesser extent. This can be made to account for many grades of deficiency, usually partial in character, for which no palpable somatic cause can be found, and for which no hereditary taint can be discovered.

The fact, however, that so large a number of the mentally deficient show some tangible cause for their deficiency gives hope that soon most of them will be found of that nature, and that the application of proper corrective measures will help to reduce the number of the misfit. Where, on the other hand, the causes are discovered, but are not correctable, a search can be made for patent faculties, these developed on an intensive scale, and the individual in this way be made useful. The many so-called "savant idiots" illustrate the possibilities in this direction.

The purely somatic conditions causing mental deficiency are increased indirectly by the mass of deficiencies caused by environmental and nutritional abuses. The anemic, nervous and undernourished children can often be made mentally efficient by proper remedial measures.

The somatic conditions which should logically exercise the greatest influence on mental efficiency, but which are so often overlooked, are the neurological ones. While spinal affections play a small part, except when they reach the higher centres in their upward path, all neurological conditions affecting the brain have a very marked influence on the mind. Whether it is an epileptic condition, an apoplectic stroke, traumatic injuries to the brain, brain growths or other sources of pressure, arterial degenerations and the like, they all show some degree of mental deterioration. Besides, there are a great many lesser neurological conditions of indefinite symptomatology and pathology which are accompanied by rather more definite mental deterioration. Indeed, wherever there are found these vague neurological symptoms accompanying mental deterioration a more thorough search must be made for profound brain changes. There is a tendency to consider these dual manifestations as psychoses, particularly as a late development of dementia precox, when in fact they are regressions in the degree of mental development. In the inherent mental deficiencies there is no mental organization at all because of some somatic change. Here the reverse condition obtains; there is no mental organization because of subsequently acquired somatic etiological factors.

In any event it is very important to differentiate these causes. In the young, where the deficiency is somatic but remediable, proper diagnoses will reclaim a great many. In later deteriorations of neurological origin they will be given proper treatment where possible, instead of considering them dementias of late development and prescribing only custodial care. The diagnosis of mental deficiency as such is fraught with a great deal of danger and often with a great deal of injustice. Causal relations must be searched for in mental conditions as in the physical.

NOTIFICATION OF PREGNANCY.

SUCH a radical proposal as the one to make pregnancy notifiable will, of course, arouse a storm of protest, especially from those quarters whence comes opposition to all innovations. And yet on examining the idea judicially we find that it has much to recommend it, the obvious advantages being the beneficial effect which the proper supervision of pregnancy might be expected to have among the more ignorant mothers and the possibility of combating the twin evils of abortion and infanticide.

Dr. S. G. Moore[1] has given the matter considerable attention in the course of the Milroy lectures this year. He calls attention to the marvelous work of Morel de Villiers in France, who accomplished a complete abolition of infant mortality in a small rural community for a ten-year period—1893-1903. This remarkable result was obtained only by the strictest supervision of the period from the recognition of pregnancy until the baby was several years old. One of the features of this system was the compulsory notification of pregnancy. This example has been followed by the borough of Huddersfield, in England, where Dr. Moore is health officer; so far as possible, that is, provisions have been made encouraging the voluntary notification of pregnancy and seeing that such cases are followed up and given every advantage at the disposal of the community to ensure healthy offspring.

As might have been anticipated, the suggestion, which has been made very much in earnest in England, that notification of pregnancy be made compulsory, has been discussed with some heat. Dr. J. W. Ballantyne sums up the arguments for and against rather concisely in the *British Medical Journal* for April 22. The points in favor of the scheme are the statistical studies of pregnancy thus made possible, with the consequent stimulus to study of that important physiological period and the probably resultant check to the frequency of abortions and attempts at them. Against the scheme are its intrusion upon domestic privacy, the difficulties of making an early diagnosis of pregnancy in some cases,—and early diagnosis would be very important, so many abortions being done in the third month or earlier,—and finally the fact that the results aimed for seem to be gradually becoming attained by the modern education of the public in hygienic matters, more particularly in sexual hygiene. Ballantyne does not believe that the time is ripe for compulsory notification, but suggests that the profession encourage voluntary notification and make it their duty to see that when a case is thus reported the mother is aided in every way possible so that she may herself become an ardent supporter of the system.

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[1] The Milroy Lectures, on Infantile Mortality and the Relative Practical Value of Measures Directed to Its Prevention, delivered before the Royal College of Physicians of London, by S. G. Moore, M.D., during March, 1916.

CRIMINAL ABORTION AND THE WILL TO SURVIVE.

At one of the Boston theatres during the past week there has been displayed to the public, only adults being admitted, a moving picture aimed to impress the laity with some of the evils of criminal abortion. For the first, private performance invitations were issued to a number of clergymen, physicians, and teachers,—men and women. Everyone present was asked to express an opinion in writing; and upon the approval of a majority, the public production of the film was permitted by the censors.

There was in the picture nothing immoral, obscene, salacious or otherwise objectionable. On the contrary, without morbid exaggeration, as in the case of *Damaged Goods,* it presented vice as a

> "monster of such hideous mien
> As to be dreaded needs but to be seen."

Unfortunately, it erred in suggesting that abortion and birth-control are practised chiefly by the fashionable and well-to-do, whereas in point of fact they are even commoner among the poor and middle classes. Indeed, this is their greatest evil. If they affected only the rich, they would be of relatively little biologic importance.

Nevertheless, it is probably true that "guilty creatures sitting at a play,"—of whatever class,—may be moved by it. Therefore, it would seem that any effect which this picture might produce should be good,—since it could hardly be evil,—both in the self-conviction and possible reform of the guilty and in the education of the innocent. Whether it will be likely to produce any appreciable or important effect may well be questioned. As a matter of fact, the control of the evils of criminal abortion, either procured or self-induced, depends ultimately on the awakening of a personal race-consciousness and will for survival among individuals at large. Any educational measure, however, which may aid, even in small degree, towards securing this end in the lay community, is to be approved by the medical profession.

ANNOUNCEMENT.

HARVARD GRADUATE SCHOOL OF MEDICINE,

COURSE IN MILITARY MEDICINE.

The Harvard Graduate School announced a course of lectures on Military Medicine to be given during July, chiefly by Major Chamberlain, of the Medical Corps of the Army. Unfortunately it was found at the last moment that Major Chamberlain could not be spared from the Mexican border, but, as he had already sent his lectures to the School, we are able to go on with the course essentially as announced. The lectures will be given by instructors of the Medical School and others, who are familiar with the subjects assigned to them.

These lectures are give in the Administration Building of the Harvard Medical School, at 5 p.m. daily (except Saturdays and Sundays) during July. They are open to members of the profession without charge.

The School will not be able to repeat the course in August, as expected, but will offer similar instruction next fall.

H. D. Arnold, M.D.,
Dean.

MEDICAL NOTES.

New York Poliomyelitis Epidemic.—The epidemic of poliomyelitis in Brooklyn, N. Y., which we noted in last week's issue of the Journal, continues to spread and seems to be assuming rather serious proportions. On July 1 there had been already 379 cases and 59 deaths; 23 more deaths occurred on July 1, 2 and 3. The New York Health Department is taking active measures to combat the disease and has issued frequent bulletins on the subject. The death rate of this epidemic is relatively high and has been computed as at least 20%, which is four times as great as the death rate during the extensive epidemic of 1907. At a conference of Brooklyn physicians, held in Polhemus Memorial Hall under the joint auspices of the Department of Health and the special poliomyelitis committee, Dr. Simon Flexner presented a statement summarizing our present knowledge of the disease and the modes of its transmission and prophylaxis. On July 3 the Health Department reported 67 new cases. The Department has begun the distribution of 500,000 warning leaflets based on Dr. Flexner's statements. The Department has also postponed the holding of free open-air moving picture shows which it had been proposed to give during July, and has notified all motion picture theatres in the city not to admit children under sixteen years of age after July 5. On this date the total of reported cases was 702 and of deaths 138 since June 26. The Mayor has ordered a special bond issue of $80,000 to provide funds for combating the epidemic. Great effort is being made to prevent the exportation of the infection to other cities, but several cases have already developed on Long Island and six at Hudson, N. Y.

The Ameerican Posture League.—A joint meeting of the American Posture League and the American School Hygiene Association was held on July 5, in Teachers College, Columbia University, New York, N. Y. Papers were read by Dr. Eliza M. Mosher, Dr. William H. Burnham, Dr. Henry Ling Taylor and others.

Dentistry in the French Army.—In recognition of the importance of well-kept teeth to the soldiers in the French army, over one thousand dentists are employed in the medical corps, five hundred in the trenches and the rest in interior hospitals. Not only are their services demanded in keeping the teeth of the soldiers in good condition, but the large proportion of face injuries has required their most expert surgical skill in repairing and reconstructing damaged jaws and mouths.

Honorary Degrees for Physicians.—In a recent issue of the Journal we noted the award of several honorary degrees to physicians at American university commencements. The following further awards have also been made: Colby University awarded the honorary degree of A.M. to Dr. James Frederick Hill of Waterville, Me. The University of Chicago awareded the honorary degree of LL.D. to Dr. William H. Welch, professor of pathology at Johns Hopkins University. The University of Vermont awarded the honorary degree of Sc.D. to Dr. Fred H. Albee of New York, and the University of Wisconsin awarded the same degree to Dr. Ludwig Hektoen, director of the Chicago Memorial Institute for Infectious Diseases.

A Generous Medical Gift.—It is announced that Dr. Kenneth Dowes of New York has recently given the sum of $95,000 to the Johns Hopkins Hospital to be devoted to the investigation of tuberculosis and to the training of physicians and students in the recognition of the disease and the management and care of patients.

Prevalence of Malaria, Meningitis, Pellagra, Poliomlelitis, Smallpox and Typhoid.—The weekly reports of the United States Public Health Service for June 23 and 30, 1916, state that during the month of May in this year there were reported eleven cases of cerebrospinal meningitis in Ohio, twelve in Massachusetts and thirteen in Wisconsin. In Mississippi there were 9,485 cases of malaria, 1,168 of pellagra, 148 of smallpox, 35 of poliomyelitis and and 399 of typhoid. There were 87 cases of typhoid in Maryland and 75 in Massachusetts. Virginia reported 807 cases of malaria, 79 of pellagra, 28 of poliomyelitis, 107 of smallpox and 155 of typhoid. In Wisconsin there were 89 cases of smallpox and 41 of typhoid.

EUROPEAN WAR NOTES.

Benefactions of the Rockefeller Foundation.—The war relief commission of the Rockefeller Foundation, has recently issued a report showing that during the six months ended June 30, 1916, it appropriated more than $3,000,000, and has already expended over two-thirds of the appropriation.

"Of the total of $2,159,985 expended during the six months, by far the largest amount was devoted to Belgium, $1,290,292 having gone for the relief in that country or among Belgians in other countries. Armenian and Syrian relief was next with $360,000, and Serbian relief third with $148,894. An appropriation of $1,000,000 for relief in Poland, Serbia, Montenegro and Albania is yet to be expended.

"For relief work in and about Constantinople, $35,000 was expended, while $55,000 was devoted to the surgical laboratory at Compiègne, founded by the Rockefeller Institute for Medical Research and which is under the direction of Dr. Alexis Carrel.

"Other appropriations made by the Foundation, exclusive of war measures, include: American Academy, Rome, $10,000; Bureau of Municipal Research, for Studies in the Administration of the Government of the State of New York, $10,000; International Health Board, $75,000; general education boards, $250,000; for establishment and maintenance of school of hygiene and public health at Johns Hopkins University, $267,000."

Fevers of Serbia.—A recent study of fevers other than typhus abounding in Serbia reveals a condition in that section of Europe which is analogous to conditions in the Eastern Orient.

"In the valleys of the Save and the Danube there is a predominance of malarial maladies, the most common of which are the tertiary and double tertiary forms. Related fevers are recurrent, intermittent, oscillatory and some of very short duration. Many feverish states were found which depend upon intestinal intoxications, where there may be demonstrated not only the B. coli and types A and B of the paratyphoid organism, but bacteria ordinarily saprophytic, which take on infectious forms. B. gärtneri is one of the most common in the intoxications of alimentary origin in Serbia. There is here a great assemblage of fevers, which include Malta and Kala-Azar, and with these septicemic fevers produced by parasites which evolve in the mediums of the blood. Then again there are dysenteries and certain choleriform diarrheas which seem to be produced by a vibrion peculiar to these lands."

WAR RELIEF FUNDS.—On July 8 the totals of the principal New England relief funds for the European War reached the following amounts:

Belgian Fund	$133,407.15
French Wounded Fund	93,664.71
Army Huts Fund	66,190.60
British Imperial Fund	60,420.10
Armenian Fund	53,050.86
Polish Fund	38,915.37
Surgical Dressings Fund	37,213.87
Facial Hospital Fund	22,925.55
Italian Fund	20,260.04

MEXICAN NOTES.

SCARCITY OF DRUGS IN THE UNITED STATES NAVY.—Report from Washington on June 27 states that on account of the Mexican situation, request has been made of Congress for an urgent deficiency appropriation of $55,000 to make up the scarcity of drugs in the Navy due to the present high price of medical supplies on account of the European War. One of the chief drugs, of which a large supply is required in the Navy in case of actual service, is quinine.

"The advance in the price of quinine has been irregular, ranging from 28 cents or 30 cents an ounce to $4.00 an ounce, the highest price paid by the Government. The Navy is now purchasing it at $1.60 or $1.75, according to the way it can be picked up. At one time when the Government was in urgent need of quinine, dealers offered to sell a ton at $4.00 an ounce, but this was too steep a price and the offer was rejected. This bid came from Amsterdam by cable and the purchase of a ton of quinine at this price would have cost in the neighborhood of $125,000."

MEDICAL TRAINING CAMPS AT PLATTSBURG.—Report from New York on July 4 states that two training camps for medical men will be held at Plattsburg for two weeks each, beginning on July 12 and 24, respectively. These camps will be opened to properly qualified physicians and surgeons, who will receive special courses in camp sanitation, military hygiene and first aid.

BOSTON HOSPITAL UNITS.—In last week's issue of the JOURNAL we noted the organization by the American Red Cross of a series of thirteen base hospital units in preparation for actual service in the event of war with Mexico, should need require. The three Boston units are based respectively on the staffs of the Massachusetts General Hospital, the Boston City Hospital and the Harvard Medical School. Each unit is to consist of 196 persons, comprising nine surgeons, seven physicians, three laboratory experts, two dentists, fifty nurses, twenty-five nurses' aids, one chaplain, with the necessary orderlies, ambulance drivers, cooks, waiters and clerks. The following is the medical personnel of the three Boston units as thus far constituted:

Boston City Hospital.—Dr. John J. Dowling, director; Dr. Edward H. Nichols, senior surgical officer; Dr. Joshua C. Hubbard, Dr. Walter C. Howe, Dr. Halsey B. Loder, Dr. Arthur R. Kimpton, Dr. Robert C. Cochrane, Dr. Irving J. Walker, surgical officers; Dr. Allen Greenwood, ophthalmologist; Dr. Calvin B. Faunce, otologist and laryngologist; Dr. Arial W. George, x-ray; Dr. John J. Thomas, Dr. William H. Robey, Jr., senior medical officers; Dr. Francis W. Palfrey, Dr. Cadis Phipps, Dr. W. Richard Ohler, Dr. Albert A. Hornor, medical officers; Dr. Edgar M. Medlar, bacteriologist; Dr. Leroy U. Gardner, pathologist; Dr. Edmund W. Wilson, adjutant; Dr. William F. Dolan, quartermaster; and Miss Emma Nichols, chief nurse.

Massachusetts General Hospital.—Director, Dr. Frederic A. Washburn; adjutant, Dr. Byam Hollings; quartermaster, Dr. Eustace I. Fiske; assistant director, surgical section, Dr. Lincoln Davis; assistant director, medical section, Dr. Richard C. Cabot; assistant director, laboratory section, Dr. J. Homer Wright; surgeons, Drs. Zabdiel B. Adams (orthopedist), Beth Vincent, William J. Mixter, Ralph A. Hatch (oculist), Elliott C. Cutler, Arthur W. Allen, George A. Leland, Jr.; physicians, Drs. James H. Means, Andrew W. Sellards, George Clymer (neurologist), Paul D. White, Wade S. Wright; bacteriologist, Dr. Roger Kinnicutt; roentgenologist, Dr. Walter J. Dodd; dentists, Drs. Leroy M. S. Miner and Charles W. Ringer; chief nurse, Miss Sara E. Parsons.

Harvard Medical School.—Director, Dr. Harvey Cushing; assistant directors, Dr. Richard P. Strong, laboratory section; Dr. Roger I. Lee, medical section; Dr. David Cheever, surgical section; Dr. William H. Potter, dental section; adjutant, Dr. Louis H. Burlingham; surgeons, Dr. George S. Derby (ophthalmology), Dr. Robert B. Osgood (orthopedics), Dr. Walter M. Boothby, Dr. Edward B. Towne, Dr. Frank R. Ober, Dr. Gilbert Horax, Dr. Samuel C. Harvey, Dr. Harris H. Vail (John Harvard Fellow, 1916), Dr. Thomas R. Goethals (John Harvard Fellow, 1916); physicians, Dr. Reginald Fitz, Dr. George C. Shattuck, Dr. George P. Denny, Dr. George R. Minot, Dr. Henry Lyman; dentist, Dr. Roger B. Taft; bacteriologist, Dr. James L. Stoddard; roentgenologist, Dr. Percy Brown; chief nurse, Miss Carrie M. Hall.

BOSTON AND NEW ENGLAND.

THE WEEK'S DEATH RATE IN BOSTON.—During the week ending July 8, 1916, there were 215 deaths reported, with a rate of 14.74 per 1000 population, as compared with 183 and a rate of 12.75 for the corresponding week of last year. There were 32 deaths under one year, as compared with 26 last year, and 57 deaths over 60 years of age, against 55 last year.

During the week the number of cases of principal reportable diseases were: Diphtheria, 45; scarlet fever, 14; measles, 202; whooping cough, 15; typhoid fever, 2; tuberculosis, 59.

Included in the above were the following cases of non-residents: Diphtheria, 7; scarlet fever, 5; measles, 1; tuberculosis, 5.

Total deaths from these diseases were: Diphtheria, 4; tuberculosis, 17; measles, 5.

A NEW OPPORTUNITY: FELLOWSHIPS IN DISTRICT WORK.—The Harvard Medical School has established four fellowships to be awarded to graduates in medicine, to be known as the Boston Dispensary fellowships. Applicants must have graduated from a medical school of good standing and must have had a hospital internship or its equivalent. Appointments will be made after consideration of applicants jointly by the authorities of the Harvard Medical School and of the Boston Dispensary.

The Boston Dispensary has for 120 years provided medical service to the sick poor in their homes throughout the city, the municipality not affording this sort of service. Under the fellowship arrangement, a portion (for the present not more than five) of the district men will be on fellowship appointment. Negotiations are pending between the Boston Dispensary and the Tufts Medical School with a view of making some similar arrangement for a fellow next year.

The duties of the fellows will be to give a portion of their time to clinical work in the district service of the Boston Dispensary, treating the sick in their homes; and a portion of their time to such study, teaching, laboratory, research or clinical work as may be assigned by the Medical School. The stipend of a fellowship will be $500 when the physician gives part time, or $750 when the physician devotes his entire time to the district work and to the Medical School. A physician desiring to pursue post-graduate study or a course in public health work, for instance, might be enabled through such a fellowship to complete a course in one or two years while receiving at the same time valuable experience.

Application for these fellowships should be made to the Dean of the Harvard Medical School, Longwood Avenue, Boston, Mass.; or to the Director of the Boston Dispensary, 25 Bennet Street, Boston.

HARVARD MEDICAL ALUMNI ASSOCIATION.—The annual meeting of the Harvard Medical Alumni Association was held in Harvard Hall, Cambridge, Mass., on June 22, about 150 members being present. The following officers were elected for the ensuing year: President, Dr. Frederick C. Shattuck; secretary, Dr. Arthur B. Emmons, 2d; treasurer, Dr. James B. Ayer. Dr. Francis M. Rackemann, Dr. William W. Howell and Dr. Charles D. Eastman were elected councilors for a term of four years, and Dr. Elliott P. Joslin, councilor for the term of two years in succession to the late Dr. Silas A. Houghton.

NEW ENGLAND DEACONESS HOSPITAL.—The new private room annex of the New England Deaconess Hospital at Concord, Mass., the gift of an anonymous donor, was open for public inspection on July 1. The building, completed and furnished at a cost of $20,000, contains eight private rooms, each with a sun porch and balcony, with nurses' quarters on the second floor.

WINCHESTER HOSPITAL TRAINING SCHOOL.—The annual graduation exercises of the Winchester Hospital Training School were held at Winchester, Mass., on June 23. The principal address was by Dr. DeWitt G. Wilcox of Boston. The president of the Winchester Visiting Nurse Association awarded diplomas to a class of three pupil candidates.

BROCKTON DEPARTMENT OF PUBLIC HEALTH.—The thirty-fourth annual report of the Department of Public Health of Brockton, Mass., shows a steadily decreasing death rate and infant mortality rate. The death rate is the lowest since 1890, and the infant mortality rate the lowest since 1896. The birth rate was 23.9 per 1000. The six leading causes of death for the past five years in this city are, in order of their numbers, diseases of the heart and arteries, pneumonia, congenital debility, diseases of the brain and spinal cord, cancer and tuberculosis. Brockton maintains an unusually low infant mortality rate, averaging 2.8 per thousand inhabitants as compared with 3.7 for Massachusetts as a whole. Credit for this is given to the careful inspection of milk and the attention that is paid to the sanitary conditions of the city. Two baby milk stations were conducted during June, July, August and September, 1915. One station is situated on the east side of the city where the population is largely Jewish and Italian, the other is in the northern section of the city, among the Lithuanian people. A total of 196 babies came under supervision, of which number 98 were brought to the milk station clinics. No deaths from diarrhoeal diseases occurred among these 196 babies.

Miscellany.

RED CROSS APPEAL AND INSTRUCTIONS.

AN APPEAL TO THE AMERICAN PEOPLE.

With the calling of many thousand men into military service, new and heavy responsibilities fall upon the Red Cross, in its relation to the army and navy on the one hand, and to the people of the United States on the other. At present these responsibilities are, first, to provide assistance to the medical services of the armed forces of the government, by the organization of base hospitals, ambulance columns and other units for the care of our sick and wounded; second, to purchase, collect, forward and distribute supplies for our soldiers in field, camp and hospital; third, to help soldiers' families left destitute and not provided for by other agencies.

For the necessary means to discharge this patriotic service, the Red Cross, in accordance with its custom, turns to the public, whose sympathy and generosity it has learned implicitly to trust. Upon the response to this appeal must depend the adequacy with which the Red Cross will be enabled to help our sick and wounded soldiers, to soften the harshness of field service, and to meet urgent needs among dependents at home.

In anticipation of such a grave emergency as this, the Red Cross has been building up an organization competent to meet the obligations of its national charter and to make effective the generosity of a patriotic people.

Contributions may be sent to the treasurer of the local chapter, or checks may be made payable to the American Red Cross, and sent to national headquarters in Washington.

William H. Taft
Chairman, Central Committee,
American Red Cross.

INSTRUCTIONS TO RED CROSS CHAPTERS.

In accordance with the obligations of its National Charter and in keeping with the recognized purposes of Red Cross societies of all countries, the American Red Cross will participate in the care of destitute families of soldiers and sailors called into military service. It is neither the intention nor the desire of the Red Cross, however, to monopolize this work. On the contrary the Red Cross hopes that through the patriotic generosity of employers, and possibly through governmental action, the chief part of this problem may be solved. With private agencies which enter this field the Red Cross desires to maintain relations of close coöperation to the end that the work may be done with efficiency and without confusion.

In its nature this relief work is local in character. It should never lose its spirit of neighborly sympathy and responsibility. For this reason the Red Cross will give its assistance through its Chapter and such other local organizations as it may authorize and will expect that the money and supplies necessary will be contributed by the communities in which the work is done.

DUTIES OF RED CROSS CHAPTERS.

In the instructions to Chapters dated June 22d, attention was called to the importance of dividing the work of each Chapter into a Section for Military Relief and a Section for Civilian Relief. The collection, purchase, warehousing, packing and forwarding of supplies to the soldiers and sailors is within the duty of the Chapter Section on Military Relief.

All work pertaining to the relief of destitute families of soldiers and sailors falls within the duty of the Section for Civilian Relief. The following instructions are for the guidance of Chapters in the conduct of relief operations in behalf of destitute families.

COLLECTION OF INFORMATION.

In order that the work of relief may be intelligently conducted and with justice to all, a carefully written record is necessary. This record should contain the facts on which the action of the Chapter is based in the case of each family. It should contain the name of the family, number and ages of children, a summary of the family's own resources and a statement showing whether help is also being received from other sources, and if so, how much. This information should be retained until the work growing out of the Mexican disturbance is completed, as it will be needed for reference from time to time and will serve as a basis for a report when the work is finished.

DISTRIBUTION OF RELIEF.

Avoid haphazard, spasmodic and irregular methods of administering relief. This duty should be entrusted to a strong, careful, unexcitable committee, and all distribution should be directed and controlled by that committee. It is desirable that the collection of information on which relief is given should also be under the direction of this committee. A simple record should be kept of all relief given out and to whom given. At the beginning this record may seem unimportant, but as time passes it will be found indispensable if effective and satisfactory work is to be done. It will also be found of value in answer to criticism which is certain to arise.

SHALL RELIEF BE IN THE FORM OF CASH OR SUPPLIES?

No iron-clad rule should be laid down as an answer to this question. In general it may be said that money goes farther if it is expended by the committee in buying relief supplies in large quantities, at such discounts as generous merchants will allow. Also many contributions to the Chapter will be in the form of supplies instead of cash.

On the other hand it is probable that the recipients of the help in a majority of instances will be persons who are accustomed to buying for their households and know how to buy with economy. With cash they can buy such things as their families ordinarily use and prefer. The organization for giving relief in money is simpler and less cumbersome tran that necessary for distributing supplies.

RAISING AND EXPENDING FUNDS.

For the purpose of maintaining the work of relief herein described Chapters of the Red Cross are hereby authorized to solocit contributions of money and supplies from the public, within their respective jurisdictions, and to expend or distribute such supplies and funds under proper safeguards. It is of the utmost importance that an accurate account shall be kept of all money received and all expended. Receipts must be taken for all money paid out, and no money should be paid out except on the approval of a Chapter officer or committee, vested by the Chapter with power to authorize expenditures. These financial accounts should be so complete and accurate that when they are audited later they will show the source of every dollar received and the place where every dollar went. The keeping of the books should be placed in the hands of experienced bookkeepers.

TACT AND FAIRNESS NECESSARY

Tact and absolute fairness are essential in the work of the Red Cross. It is to be remembered at all times that the families for whose welfare this work is carried on are independent and self-respecting and are objects of our solicitude solely because their natural supporters have been called into the service of the country to protect the lives and property of our fellow citizens. There is no shadow or taint of charity, in the offensive use of that word, in the work which the Red Cross is doing; it is in fact an attempt to fulfill a sacred obligation which we owe to the men who are in the ranks for the protection of us all.

Ernest P. Bicknell,
Director General,
Civilian Relief.

Approved:
Arthur Murray,
Acting Chairman,
Central Committee.

The following statement was issued on July 5 by Major General Arthur Murray, U. S. A., Acting Chairman of the Central Committee of the American Red Cross:

"Supplementary instructions for the collecting of military relief supplies as a result of the concentration of American troops on our Mexican border, just issued by the American Red Cross to its chapters and auxiliaries, name six intermediate depots in railroad centres of the United States where supplies should be sent by them to be assorted and classified, and three distributing depots from which final distribution of supplies will be made to the troops at the front. With two exceptions, Cincinnati and Denver, the exact addresses of the intermediate depots are given below. The points selected and the districts embraced are as follows:

"*New York District*, Red Cross Supply Depot, Bush Terminal No. 19, 39th Street and Second Avenue, South Brooklyn, N. Y.—Includes all New England and the Eastern part of New York State.

"*Cincinnati District*, headquarters in Cincinnati, O.—Includes Pennsylvania, the Western part of New York State, New Jersey, Delaware, Maryland, West Virginia, Ohio and Indiana.

"*Chicago District*, headquarters Red Cross Supply Depot, clearing Argo District, Chicago, Ill.—Includes Minnesota, Wisconsin, Michigan, and Northern Illinois.

"*Kansas City District*, Red Cross Supply Depot, care Montgomery, Ward & Co., Kansas City, Mo.—Includes North and South Dakota, Nebraska, Iowa, Northern Missouri, and Northeastern Kansas.

"*Denver District*, headquarters in Denver, Colo.—Includes Montana, Idaho, Wyoming, Utah, and Northern Colorado.

"*San Francisco District*, headquarters Red Cross Supply Depot, care Mr. A. B. C. Dohrmann, San Francisco, Cal.—Includes Washington, Oregon, Nevada, and Northern California."

The headquarters of the following additional three districts are designated "distributing depots":

"*Douglas*, Ariz., headquarters Red Cross Supply Depot, care Mayor W. H. Adamson.—For all of Arizona and the southern part of California (Los Angeles).

"*El Paso, Tex.*, Red Cross Supply Depot, 516 San Francisco Street, El Paso, Tex.—For all supplies from intermediate depots at Kansas City, Denver, San Francisco, and from all territory west of Kansas not otherwise embraced.

"*San Antonio, Tex., District,* headquarters Red CrossSupply Depot, Avenue E and Fourth Street, San Antonio, Tex.—For all supplies from intermediate depots at New York, Cincinnati, Chicago, and from all southern states situated to the east of a north and south line through the western boundary of Kansas.

"Each depot will be under the charge of a manager who will have general supervision over the receipt, storage, and shipment of the supplies, and, in the case of distributing depots, of their final disposition. Instructions for the shipment of supplies to, and operation of, these depots have been prescribed at length—those relating to shipment of supplies may be obtained on application to Chapters.

"These intermediate and distributing depots having been established by the Red Cross for the purpose of facilitating the distribution of supplies from all parts of the country to our soldiers and sailors, the Red Cross would be pleased to have all patriotic American citizens and associations desiring to give aid and comfort to them make use of the facilities thus afforded by its system of depots for the shipment and distribution of supplies on the Mexican border.

ARTHUR MURRAY,
Major General, U. S. A.,
Acting Chairman, Central Committee,
American Red Cross."

Correspondence.

A QUESTION OF MEDICAL ETHICS.

WAUKESHA, WIS., July 1, 1916.

Mr. Editor: For many years now the profession of medicine has been purging itself of poor medical schools. We have been trying to standardize the schools so as to eliminate the poor ones, to standardize hospitals and, in general, raise the level of medical education and through education the level of practice. The results of all this work are known to all the press and the public.

Physicians do not often go into print themselves but many give their time freely to interviewers who are better qualified to write their material up and who are given a wider hearing.

Recognizing as we have the tremendous inferiority of many happily defunct schools of medicine or diploma factories it is a sore in our side that the product of these schools, thousands in number, have to a greater or less extent obtained the confidence of the public and worse yet are virtually protected and shielded by the profession itself. Many of them are totally incompetent, and many are actuated by no desire to help humanity. Yet it is insisted upon by our code of ethics that nothing damaging to the profession should be allowed to get to the public ear. Criticisms should be made only in medical publications. There is no profession which holds its code of ethics so jealously. We are always suspicious of people who parade their virtue. They are more than likely to be assuming a virtue if they have it not.

It seems to me that we are decidedly at fault and that it is a false sense of loyalty that causes this state of affairs, and the public has a perfect right to call us inconsistent and insincere.

Isn't our duty to the public as great or even greater than to the unfit practitioner? Is it always necessary for the consultant to leave the impression with the family that the general practitioner is doing exactly the right thing? Even if no harm results from his ignorance, is it right to leave the impression that he is a proper guardian of the health of that family? Should we always shield the practitioner who never ought to have left the plow? Is the public expected to discriminate in matters medical? You can claim that tact will obviate all difficulties between consultant, practitioner and family, but it won't. It can't make a good practitioner out of a man who never made a physical examination.

In the first place we are all too afraid of admitting our mistakes and too afraid of telling other people theirs. More frequent consultations among physicians, group action, frank correction of mistakes and admission of error would in a short time benefit people and physicians both and would lead to a better understanding and ability to coöperate, which is lacking at present.

Our loyalty to false standards of loyalty creates between the profession and the public a legitimate atmosphere of suspicion, and in the profession it creates insincerity and lack of frankness. Our reluctance to admit our faults to the public and our mistakes among ourselves leads to outbursts of criticism when such an article as Dr. Cabot's "Better Doctoring for Less Money" appears. It almost makes our judgment final that acrid criticisms come from those whom the cap fits or from those inspired by false standards of ethics.

The assumption of knowledge in all branches of medicine is an admission of ignorance and to point out this fact should cause no great stir nor adverse criticism.

Let us get together in groups and clubs and put aside petty jealousies and work together for the common good. If we *worked* in harmony more and *talked* harmony less, advance in medical practice would be assured and unobstructed.

H. P. GREELEY, M.D.

CHANGES IN THE MEDICAL CORPS, U. S. NAVY, FOR THE WEEK ENDING JUNE 24, 1916.

June 16: P. A. Surgeon J. A. Biello, detached from the *Kentucky* to home—wait orders.

P. A. Surgeon W. A. Bloedorn, detached from the Navy Yard, Washington, D. C., ordered to the *Kentucky*.

P. A. Surgeon P. T. Dessez, ordered to Navy Yard, Washington, D. C.

June 19: P. A. Surgeon F. G. Abeken, to Naval Hospital, Great Lakes, Ill.

Surgeon C. C. Grieve, detached from Naval Hospital, Great Lakes, Ill., and ordered to the *Utah*.

June 21: P. A. Surgeon G. C. Thomas, detached from Naval Station, Guam, and odrered to the *Fulton*.

P. A. Surgeon A. B. Hayward, ordered to the *New Orleans*.

P. A. Surgeon W. H. Connor, detached from the *Fulton*, and ordered to the *Kansas*.

RECENT DEATHS.

DR. JULIUS HAYDEN WOODWARD, who died in New York, N. Y., on July 2, was born in 1858 at Castleton, Vt. He graduated from Cornell University and the College of Physicians and Surgeons of Columbia University. He spent some time in studying abroad and at one time taught materia medica at the University of Vermont. As a specialist in disease of the eye, ear and throat he attained much prominence.